TRANSACTIONS

OF THE

Odontological Society of Great Britain.

VOL. XXIV.—NEW SERIES.

Digitized by the Internet Archive
in 2021 with funding from
Wellcome Library

https://archive.org/details/s6777id1399051

Woodburytype.

CHAS. SPENCER BATE, F.R.S. L.D.S., Eng.

TRANSACTIONS

OF THE

ODONTOLOGICAL SOCIETY

OF

GREAT BRITAIN.

VOLUME XXIV.—NEW SERIES.

LONDON:

Printed and Published for the Society by

JOHN BALE & SONS, 87-89, GT. TITCHFIELD STREET,

OXFORD STREET, W.

1892.

WELLCOME INSTITUTE
LIBRARY
Coll. welMOmec
Call No. Ser
WU
6071

List of Officers.

—:—

President.

J. HOWARD MUMMERY

Vice-Presidents.

RESIDENT.	NON-RESIDENT.
DAVID HEPBURN.	W. B. MACLEOD (Edinburgh).
T. H. G. HARDING.	J. H. REDMAN (Brighton).
R. H. WOODHOUSE.	F. H. BALKWILL (Plymouth).

Treasurer.

THOMAS ARNOLD ROGERS.

Librarian.

ASHLEY GIBBINGS.

Curator.

STORER BENNETT.

Editor of the Transactions.

WALTER COFFIN.

Honorary Secretaries.

J. ACKERY (*Council*).
W. A. MAGGS (*Society*).
F. H. WEISS (*For Foreign Correspondence*).

Councillors.

RESIDENT.	NON-RESIDENT.
W. HERN.	W. B. BACON (Tunbridge Wells).
F. NEWLAND-PEDLEY.	H. B. MASON (Exeter).
C. J. BOYD WALLIS.	MORDAUNT A. DE C. B. STEVENS (Paris).
F. J. BENNETT.	T. S. CARTER (Leeds).
CORNELIUS ROBBINS.	W. S. WOODBURN (Glasgow).
E. G. BETTS.	W. H. WILLIAMSON (Aberdeen).
MORTON SMALE.	H. C. QUINBY (Liverpool).
B. J. BONNELL.	D. W. AMOORE (St. Leonards).
E. LLOYD-WILLIAMS.	WILSON HOGUE (Bournemouth).

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING,

November 2nd, 1891.

MR. S. J. HUTCHINSON, M.R.C.S., L.D.S.,

PRESIDENT, IN THE CHAIR.

THE Minutes of the preceding meeting having been read and confirmed,

The PRESIDENT, rising, said that before they entered upon the business of the evening he was sure that he would have the sympathy of those present in the painful duty which he had to perform. He had to announce with deep regret that, since their last meeting, Mr. Samuel Cartwright, one of their former Presidents, had passed away. He (the President) did not feel competent upon that occasion to enter upon a long speech in eulogy of Mr. Cartwright's qualities; suffice it to say that all recognised in him a leader, recognised in him a man alike honourable in every-day life and in his professional career, whose example all might well follow. The Council had, in the name of the Society, sent a vote of condolence and sympathy to Mr. Cartwright's family; he felt sure that the members of the Society would feel that they and the profession at large had sustained a great loss through Mr. Cartwright's death.

Further, he had to ask them to unite with him in sending a letter of condolence to Mr. James Smith Turner in the severe bereavement which had befallen him. All would recollect the manner in which Mr. Smith Turner had spoken at the Annual Meeting of the British Dental Association at Exeter last year, when he had told them that Mrs. Smith Turner had been a helpmeet indeed. Knowing as they did how sincere Mr. Smith Turner was in his utterances, they would realise to some extent how great his loss must be. He (the President) felt that he was only giving expression to the sentiments of the Society when he said that Mr. Smith Turner had their complete and heart-felt sympathy, for his zeal had inspired their great respect, and, further, he had been one of their former Presidents.

The PRESIDENT said he had also to announce with much regret the death of one of their oldest members, Mr. Keeling, of Epsom, whose son was a member of the Society. Without asking them to vote he would take their silence as expressing their desire that the Hon. Sec. should write letters expressive of their condolence and sympathy with the bereaved.

The PRESIDENT announced the election of H. O. Meriam, D.D.S. Salem, Mass., as a corresponding member.

Mr. S. A. COXON, of Wisbech, and Mr. VERNON KNOWLES, of Reading, having signed the Obligation Book, were duly admitted Members by the President.

Mr. C. W. C. HANDLEY, L.D.S.Glas., was nominated as a resident, and Messrs. H. ERNEST GODDARD, L.D.S.Glas., of Nottingham, and H. DRAPER MOON, L.D.S.Eng., of Newcastle-on-Tyne, were nominated as non-resident Members.

Mr. CARL SCHELLING, L.D.S., of 7, Montpelier Row, Blackheath, S.E., and Mr. J. W. STAVELEY, L.D.S., of 4, Bedford Circus, Exeter, were balloted for and duly elected resident and non-resident Members respectively.

The Librarian (Mr. Ashley Gibbings), being called upon, stated that since the last meeting the Society had received a parcel of old books, seven in number, presented by Mr. J. Trude Fripp, of Willesden, published between the dates 1819 and 1858 ; they were exceedingly interesting, and they were much indebted to Mr. Fripp for them. He had also received the usual monthly and quarterly journals.

The Curator (Mr. Storer Bennett) stated he had received two pairs of ancient primitive instruments for the Museum, one from Messrs. Rutterford & Son, being an early form of excising forceps, and one from Messrs. Taylor, which was a combination of a screw and blade, forming a pair of forceps for taking out broken-down roots.

The President felt that special notice should be taken of the books which Mr. Fripp had been kind enough to send ; they were a most valuable collection, for although he believed some were already in the Library he did not think they were the same edition.

Mr. Hern presented to the Museum an excellent specimen of a mummy skull. He gave the following history of the specimen :—About a year ago when operating for a distinguished Egyptologist he had learnt that he was about to start for Egypt on an exploring expedition, and with a thought for the Museum Mr. Hern asked him to secure, if possible, a specimen of Egyptian jaws and teeth—a request to which he had acceded in a manner Mr. Hern felt sure the Society would appreciate, and had brought back the fine specimen then exhibited. Since it had been in Mr. Hern's possession he had devoted some time to the dissection and removal of the lips, in order to show its jaws and teeth more closely. It seemed to have been the custom to insert portions of medicated cloth into the mouth, and then to close the lips over the teeth by suturing the upper lip to the lower one. The skull appeared to be that of a woman, judging from the low and scarcely marked frontal eminences, and the absence of any indication of hair glands ascertainable by microscopical investigation of sections of the skin of the lips. She was

probably a young adult of twenty-five to forty years. The jaws are well formed, with plenty of room for the contained teeth. The Upper Jaw contained fourteen teeth in a well developed Roman arch, the lateral incisors being somewhat small and peggy. The wisdom teeth were absent. All the teeth were considerably worn by attrition on their masticating surfaces; this was specially marked in the first molars: all were free from caries. The plane of the masticating surfaces was an uneven one to adapt itself to that of the lower jaw. The upper first molars, especially the left, showed a considerable amount of exposure of their palatine roots; this baring of the roots of the teeth was also shown, although more slightly, on the buccal surfaces of the canines and central incisors in positions which severally the Society so often meet with in the same affection at the present day. The Lower Jaw contained fifteen teeth, thirteen of which were permanent and two temporary. The left lower wisdom tooth and the second bicuspid on either side were absent. The jaw was well developed and presented a somewhat square but fairly normal arch. It showed a particularly interesting irregularity, viz., the retention of the second temporary molars on either side. These teeth were wedged in between the first molars and the first bicuspids, and on a lower level, in the manner the Society was acquainted with, the first molars having a marked forward obliquity, and the first bicuspids an equally marked backward one. The central incisors were smaller and were more worn on the masticating surface than the lateral incisors. The masticating surfaces of all the teeth, but particularly of the first molars, were like those of the upper jaw, much worn by attrition. The plane of the masticating surface of the lower jaw was a very uneven one, descending from the wisdom tooth on the right in a gradual decline to the anterior edge of the first molar (the second molar being about one-eighth of an inch, the first molar one-quarter of an inch, and the second temporary molar half an inch from a plane surface resting on the masticating surfaces of the teeth); then a sudden descent to the second temporary molar; thence it rises to the canine and lateral

incisor, descending again about one-sixteenth of an inch at the central incisors, and repeating somewhat similar curves on the opposite side of the mouth. The second left lower molar showed a small depression on the buccal groove, around which there was a discoloration which suggested commencing decay. The study of the specimens, essentially in relation to the presence of these irregularities, seemed to Mr. Hern to lend but little support to the theory of evolution.

Mr. M. W. Blackden being present was requested by the President to give some account of the probable age of the specimen, as well as particulars as to the finding of the skull.

Mr. Blackden said that the skull was found in a tomb in Western Thebes, which dated from about the eighteenth dynasty of the Egyptian era, *i.e.*, about 2,000 years B.C., so that the skull would be about 4,000 years old. The grave had been rifled by the Arabs who had smashed it open, thinking, no doubt, that there was treasure there. They also smashed the chest. The way in which he found it was somewhat curious. He was with a companion, Mr. Fraser, and they were trying to find a burial chamber which had been described. They enquired of the Arabs, who told them of one into which they went; it was about seventy feet deep, with a well at the end, but there was no drawing or painting of any kind. There happened to be three chambers, and in the second an extraordinary sight presented itself; the whole chamber was piled up with mummies, and in the darkness these bodies appeared to be in every conceivable attitude. The skull before them was one of two which they selected as the best. From the mummification he should say it was an original burial, and, as he had stated, about 4,000 years old.

The President said that he was sure they were very much indebted to Mr. Hern and Mr. Blackden for their communication; he thought Mr. Hern noticed the peculiarity as to the temporary molar being retained. He should

like to ask if the crown of the second bicuspid was apparent beneath the root.

Mr. HERN, interposing, remarked that he forgot to say that, on cutting into the jaw beneath the temporary molars, no trace of the crowns or crypts of the second bicuspids could be found, the bone showing only cancellous tissue.

The PRESIDENT said he had remarked that when the second molar was retained long after it should have been shed, it was not followed by a second bicuspid. There was no crown of a bicuspid appearing under the roots of the molar. It was very interesting to learn that a peculiarity observed in the present day was not unknown 4,000 years ago, as shown in the skull before them.

Mr. STORER BENNETT stated that the question of whether the retained temporary molars had any successors could easily be decided by examining the spaces between their roots; if these were filled up by cancellous bone no germs for the second bicuspids had been developed; for if development of these germs had taken place, the spaces between the roots of the temporary molars would be occupied by smooth lined cavities, formed of compact bone, the crypts for the successional teeth. He also mentioned that they had deposited in the Museum the skull of a monkey with the temporary teeth in position, and from which, on removing the outer layer of alveolus of the lower jaw, it was seen that the space between the roots of the second right lower molar was entirely filled up by spongy bone, so that no crypt existed for the successional tooth.

Mr. F. J. BENNETT thought an explanation might be furnished. The second temporary molar, and the second bicuspid which succeeds it, belong to a series undergoing change and elimination. In the dog, for instance, there were four pre-molars, two of which were small and gradually disappearing. He thought in such a specimen there was much to be found in favour of evolution, if one chose to look for it.

The PRESIDENT said that he was very glad to hear Mr. Storer Bennett's remarks upon the subject; it was a point upon which he had often felt perplexed.

Mr. BETTS remarked that the argument he saw against evolution was that it had taken 4,000 years to develop so far, and they had not got any further.

Mr. F. J. BENNETT regarded 4,000 years as a speck in the history of evolution.

Mr. W. A. MAGGS presented to the Museum on behalf of the Rev. T. S. Lea, of Tedstone Delamere Rectory, Worcester, some teeth and fragments of bone of an ancient (?) Briton. Mr. Lea wrote: "The remains were found about two feet below the surface of the ground, about eighty yards north of this house in 1882. Near them were some blackened stones, and what appeared to be the remains of a fire. Everything except what I send had perished; the skull fell to powder at once. The field has been permanent pasture as long as there is any record in the parish. Some time during the Wars of the Roses there was a small fight near Tipton Hall—an old moated farm about a quarter of a mile north of us. A field (arable) there is still known as 'Dead Man's Furlough' (? furlong). Our first impression was that the man was one of those slain at that date, but some of the teeth were shown to authorities at the British Museum, and pronounced far more ancient. The sole evidence is the worn character of the grinding surfaces, and thus there is wide opening for conjecture. The hypothesis is that dried fish and sand was a diet which would produce such results, and that they were hardly otherwise obtainable, and that represents a far earlier stage of civilisation than the Wars of the Roses." Mr. Maggs said that the remains were very interesting, and especially as the skull of a mummy just exhibited showed the excellent preservation of the teeth after 4,000 years, according to the researches of Mr. Blackden. Mr. Maggs mentioned that as the teeth and bones were found close to the surface of a porous soil—old red sandstone—he was disinclined to attribute any great age to them. He

drew attention to the absence of caries, and to the thickness of enamel on the molar teeth. He contended that the facets upon the teeth did not warrant the assumption that they were produced by sand, and he was of opinion that the remains were certainly not of an earlier date than the Wars of the Roses.

Mr. Hern said that knowing they were to have a lantern exhibit he had brought three slides, but he found they were not adapted for this lantern. He also wished to say that the models going round were rather rough, and he should like to take more perfect ones for the Museum; these he proposed to present to the Students' Society.

Mr. Hern also contributed another casual communication, describing a pedunculated tumour removed from the mouth of an old woman giving the following history:—Mrs. M., æt. sixty-two, presented herself at the Dental Hospital early in September to seek advice in regard to a tumour of the mouth, which seriously inconvenienced her in speech and mastication.

History: About five years ago she first noticed a slight swelling on the gum of the left side of the upper jaw, which she described as "like a seam or patch on the gum." This had gradually increased in size from year to year ever since. She thought the increase in size had been more noticeable during the past two years than before. She complained of no pain except slight dragging sensations now and then. For many years — nearly twenty—she had worn a dental alloy upper plate, carrying six teeth, and attached originally by bands on the left side to a canine and bicuspid, and on the right to two bicuspids. The natural teeth to which the bands were attached have one by one been lost, and patient states that the last one, a bicuspid on the left side, broke off about a year before she noticed the "seam or patch on the gum."

Patient had continued to wear the plate since the loss of the supporting teeth, although their loss and the increasing size of the growth made it very inconvenient to do so. The tilting of the plate by the growth to an angle of

forty-five degrees with the horizontal, when worn in the mouth, gave the patient a very peculiar appearance. Patient was led to seek advice on account, more particularly, of the difficulty she experienced in speaking and carrying on her business of a shopwoman, as well as of taking her food.

Present state : Occupying the left side of the mouth, so as to slightly protrude the left cheek, was a hard, moveable tumour about the size of a small pear. It was attached to

Fig. I.

Showing outer surface of tumour.

the summit of the left alveolar ridge, about the bicuspid region, by a narrow, strap-like pedicle.

Its shape was something like a flattened pear, with the stem looking backwards to the soft palate.

Its measurement in its longest diameter was: *Length*, antero-posteriorly, about two inches; *depth*, perpendicularly, about one and a-half inches; and *thickness*, laterally, nearly an inch.

In consistence it was rather hard and gristly; it was not very sensitive to touch, and was somewhat white and non-vascular on the surface; it appeared to have increased in size, in accordance with the space it had to occupy. Its outer surface was uneven, rough, and covered with large numbers of papillæ.

Its inner surface was smooth.

Its upper surface was uneven, closely adapted to, and grooved by, the edentulous alveolus. About its centre was a narrow, flat, fleshy pedicle about half an inch wide, attaching it to the gum of the upper alveolar ridge.

Its lower surface was uneven and marked on the inner side by a groove which had been in contact with the edentulous alveolar ridge of the lower jaw.

Its anterior surface was uneven, rough, and marked by indentation produced by the bases of the artificial teeth. The removal of the growth from the mouth was very simple, and presented no difficulties. The patient attended, at Mr. Hern's request, at the out-patient dental department

Fig. II.
Showing inner surface of tumour.

of Middlesex Hospital the next morning, and as she refused an anæsthetic, Mr. Hern injected a few minims of a 5 per cent. solution of cocaine hydrochlorate into the pedicle ; the base of the pedicle was then transfixed with a curved needle, threaded with a double silk ligature and tied in two halves, after which the tumour was removed with a few touches of the point of a knife. There was no hæmorrhage, and the ligatures came away in about a week.

On examination of the mouth after removal of the tumour, no trace of bone or of a buried root at the seat of

growth could be found. The model of the upper jaw which was present was taken a few weeks after the operation, and showed a perfectly smooth alveolar ridge. In structure the tumour was composed of a dense stroma of fibrous tissue, in the meshes of which were a number of cells. Its surface was studded with a multitude of simple and compound papillæ, covered with squamous epithelium, similar in appearance to the filiform and fungiform papillæ of the tongue. Mr. Hern would be glad to hear whether any members of the

Fig. III.

Showing tumour in relation with edentulous upper jaw seen from the front.

Society had met with similar growths, and their result under treatment. The length of time occupied by the growth in this case, its hardness, together with the absence of any enlarged glands or other signs of malignancy, brought him to the conclusion that this tumour was a benign one, produced originally, perhaps, by the irritation of the gum by the root of the bicuspid tooth, which occupied the position of its growth on the left alveolar ridge, and which the history showed was broken off about a year before the patient first noticed a slight swelling on the gum.

Mr. Ashley Barrett presented models of the mouth of a man, aged twenty-four. He seemed strong, robust, and athletic, and had never suffered in any way from syphilis in any form.

The model showed thirteen temporary teeth and eight permanent ones.

Mr. R. H. Woodhouse, in connection with Mr. Barrett's case, wished to throw out the question as to the limit of age when the temporary teeth existed. In his opinion he should put it not after fifty. He had a patient about forty-five when the temporary teeth become loose and came out. He thought it was a good opportunity for asking the experience of members.

The President said that the question raised by Mr. Woodhouse was a very interesting one.

Mr. Betts, in the absence of Mr. C. S. Tomes, showed for Dr. C. Woodburn a pair of excising forceps with triangular blades.

Mr. James Stocken presented models of a case of erosion. When he first saw it his impression was that it was a case of fracture, but looking at the two models he could scarcely believe that the condition had been caused by fracture. At the same time he had never seen a case of such decided erosion before.

The President mentioned that arrangements had been made by the staff of the Hospital to show the electrical system that had been introduced there. It was not quite finished, but if any members present that evening would like to see it in its present state, the staff would be happy to show it at the close of the meeting. Mr. Boyd Wallis had an electric switch-board for electrical and dental purposes, which he would show and explain if time permitted.

The President then called on Mr. Hopewell Smith to read his paper.

On a New Method of preparing Sections of Teeth and Bone, to demonstrate the Hard and Soft Tissues in Combination.

By A. Hopewell Smith, M.R.C.S., L.R.C.P., L.D.S.

Mr. President and Gentlemen, — The subject of my communication to your Society this evening is one which I believe will be of interest and importance: of interest, because it is a new treatment of a subject that has been introduced to you on a previous occasion; and of importance because, by it, new fields of research will be opened up and new departures in microscopical work effected.

It will, therefore, I hope, prove to be a valuable accession to our power of investigating and becoming more acquainted with the histology and pathology of the dental tissues, and will materially add to our knowledge a clearer comprehension of certain points which have been, and are still, somewhat problematical and wrapped up in obscurity and doubt.

To Mr. Mummery must be given more than a meed of praise for his excellent paper read last year.* The process he advocates, though diffi-

* Vide *Trans. Odonto. Soc.*, vol. xxii., No. 7.

cult to follow, is scientific and productive of most faithful results. It is nevertheless a fact that much time must be given for its proper performance, and this, combined with its complex nature, renders it tedious and at times disheartening.

With a view to obviate these difficulties, and as an adjunct to other processes, I have been, for some months past, adopting a new method of preparing sections of teeth and bone, which is simple, extremely successful, and followed by most satisfactory results.

The three great principles underlying this process are: (1) hardening or "fixing" the soft tissues, (2) complete decalcification of the hard tissues, and (3) their thorough impregnation with gum or celloidin preparatory to cutting by means of a microtome.

The employment of decalcifying agents has, of late years, been strongly deprecated as being an unscientific mode of procedure. But it is recommended by many of the leading histologists of the day. Schäfer* suggests the use of picric acid as a bone decalcifier; Kleinenberg† advises picric and sulphuric acids, while Ebner's‡ solution contains hydrochloric acid, alcohol and sodium chloride. Further, decalcifying fluids are used

---

* "Pract. Histology," 1877, p. 182.

† "Crookshank's Pract. Bacteriology," 1890, p. 26.

‡ *Idem.* p. 25.

by such practical histologists as Lee, Klein, Colman, &c. The latest writer on the subject, Dr. R. Haug* advocates a combination of nitric acid, alcohol and Na Cl, and speaking of its action he says: "This solution decalcifies rapidly without destroying the tissues, and may be used for bone of all densities and ages. . . . Preparations stain well after this method." And Dr. John Hart, of New York, describes in the *Dental Cosmos*, for September 1891, a method of preparation, by immersing previously ground-down slabs of dentine and enamel in a 6 per cent. solution of glacial acetic acid for ten hours.

Thus the use of softening re-agents would seem to be perfectly legitimate, and personally speaking, I have found the results compare most favourably with sections prepared by methods of grinding down or cutting without decalcification.

In considering the subject of this paper, it will be convenient to describe it in three parts:—

(*a.*) A brief account of the process.

(*b.*) Its advantages.

(*c.*) Its results.

(*a.*) As already mentioned, the mode of procedure advances in three stages: first, fixing and hardening the soft tissues; secondly, softening the hard tissues; and lastly, impregnating

---

* *Zeit. f. Wiss. Mikr.*, viii. (1891), pp. 1-11.

them with suitable re-agents for cutting on a microtome.

(1) A perfectly fresh tooth is taken, and, having been quickly washed in water, is immediately placed in a solution of bichromate of potash 2 per cent. with sulphate of sodium 1 per cent. and distilled water, otherwise called Müller's fluid: and here it remains for from three to four weeks. It may be necessary to enlarge the apical foramen with a fissure bur on the dental engine.

For "fixing" and hardening the soft tissues Müller's fluid is by far the best re-agent to employ. It possesses great penetrating power, does not cause shrinkage of the cells or fibrous tissues, and hardens them uniformly. The amount of the fluid should exceed the bulk of the tooth by about twenty times. It should be put into a glass-stoppered bottle, changed on the fourth day and again at the end of a fortnight; after which time the tooth must be removed for ten to twenty days to alcohol (84 per cent.), which completes the hardening process. The tissues of the pulp will then be found to have become rather tough, the cells will be unaltered in shape, there will be no recession from the hard dentinal walls, and no imperfect coagulation of the tissues. Sometimes blood corpuscles will be retained in the capillary vessels of the pulp. In some cases, alcohol (84 per cent.) may be used instead of Müller's

fluid, the tooth then remaining in it for the same period of time or even longer.

(2) The tooth is now removed from the hardening fluid, well washed in water, its apical foramen closed or the soft parts covered with collodion, and then immersed in an acid solution consisting of—

HCl (pure), 12 parts.
HNO (non-fuming), 30 parts.
Aqua dest., 108 parts.

This is to be used in the following manner:—The tooth—a canine or bicuspid for choice—is placed in a Wolrab's gold cylinder bottle containing 12 c.c. of a 10 per cent. solution of HCl, which must be freshly made. At the end of fifteen hours, 1.5 c.c. of non-fuming HNO_3 are added to the solution, and the same repeated at the end of forty-eight hours.

After immersion for from seventy-five to eighty hours for molars decalcification is complete and the tooth removed. (This is not absolutely correct for temporary and small permanent teeth, which naturally require a shorter immersion than that stated. The operator must be guided by the amount of softening that has already taken place.) The tooth should then be placed for half-an-hour in a solution of lithium carbonate or sodæ bicarb.—5 grs. to the ounce—and then thoroughly washed in distilled water.

Rapid decalcification of dentine and cementum is thus brought about—a matter of importance, I believe, for their structural relations are unaltered and the pulp and periosteal tissues unaffected; an event which would soon occur if prolonged immersion were tried. For, as Trinkler points out, the combination of HCl and HNO_3 leads, after a week, to the evolution of free chlorine, an agent which would not only bleach but probably destroy the dental tissues. If teeth are not sufficiently softened at the end of eighty hours, a fresh solution must be used.

The above fluid is a diluted form of "aqua regia." What precise chemical changes occur in dentine and cementum it is impossible to say; histologically they both appear to be unaltered in structure; the inorganic materials being removed, while the organic substances remain *in statu quo*. Moreover, something more than a mere skeleton of the bone is obtained. Another advantage in using HCl and HNO_3 is that they are both colourless and therefore do not stain the tooth like picric and chromic acids.

(3) The next step is removal to gum mucilage —gum 2 parts, water 3 parts, and carbolic acid 10 drops to the ounce, or an alternative plan of imbedding in celloidin may be adopted. The latter is most useful if the tooth is sufficiently soft. It is important that it should be divided

into several pieces by a razor to allow of complete impregnation with gum. This generally takes place in from twelve to fifteen hours, but a good criterion is afforded by the tissue falling to the bottom of the glass bottle and no longer floating on the surface of the medium. Should incomplete impregnation occur, the tissues will be displaced by the movements of the microtome plough. Each piece of tooth is then placed on the stage of the freezing microtome and cut in the ordinary way.

The most useful stains are orange-rubine, $AuCl_3$ (according to Mr. Underwood's plan), borax-carmine or Weigert's solutions. Most excellent results are obtained by using orange-rubine as a general stain in the following manner: the sections should be well washed in distilled water, transferred on a section lifter to a diluted solution of orange-rubine (1 part stain to 2 parts distilled water) and left there for twelve hours. They are then passed through the strong solution, all excess of stain washed off by irrigating with distilled water, and subsequently placed for three minutes in absolute alcohol, which dehydrates them. After "clearing" for one-and-a-half minutes in cedar oil, they are permanently mounted in Canada balsam.

The steps of the process may be briefly summarised thus:—

1. Immerse a newly-extracted tooth in Müller's fluid for three to four weeks, and remove to spir. vini. rect. for ten to twenty days. Alcohol (84 per cent.) may be used instead of Müller's fluid.

2. Remove, wash in water, and seal up apical foramen with collodion.

3. Place tooth in 15 c.c. of following solution :—

HCl 12 parts.
HNO_3, 30 parts.
Aq. dest., 108 parts.

Take 12 c.c. of 10 per cent. solution of HCl, and at end of fifteen hours add 1.5 c.c. of HNO_3 and at end of forty-eight hours add 1.5 c.c. of HNO_3 from commencement of immersion in acid solution.

4. Remove tooth (molar) at end of seventy-five to eighty hours and wash in solution of lithium carb. (5 grs. to an ounce) for half an hour. Wash thoroughly with distilled water.

5. Divide tooth by razor into several pieces and wash again in water. Place each piece in gum mucilage (B.P.). Leave in mucilage twelve to fifteen hours.

6. Transfer to stage of freezing microtome, cut, wash sections, and stain with orange-rubine, or gold chloride, or borax-carmine, or Weigert's solutions.

7. Dehydrate in absolute alcohol three minutes, "clear" in cedar oil one and a-half minutes, and mount in Canada balsam.

(*b.*) *The advantages of the process.*—In speaking of the value of certain re-agents, I have already had occasion to refer more than once to the primary object aimed at in the employment of this method. To repeat, this is the retention *in situ* of the soft tissues—whether anatomical or pathological—in such a manner that the morphology of the fibrous, cellular and vascular elements of pulp and periosteum, in conjunction with cementum and dentine, is in no wise altered and disturbed. Macroscopically this is easily observed, but it is only microscopically that its real value becomes apparent.

Further, although decalcifying agents are employed, it is nevertheless a fact, curious as it may seem, that the results are more faithful, and approximate more closely to the structure of the living tissues than "dried" sections of teeth and bone. There is a vast difference between the skeleton of a tooth and its normal structure. Therefore the first great advantage is that soft parts are retained in normal relationship to the hard tissues. The process is also valuable for the ease and rapidity of its performance; and it is a very simple one. The less complicated the method, the more true to nature the results. Again, any number of sections may be obtained from one and the same tooth; and they can be cut so thin that their specific gravity is only a

little higher than that of water. Moreover, it is particularly useful for dental pathology, as well as anatomy and comparative anatomy. Stains penetrate quickly and permanently. Sections of spinal column, with the cord surrounded by membranes and bone, can be easily prepared and cut. The only disadvantage is that the enamel is not preserved, the action of acids being to remove it before dentine is sufficiently softened.

(*c.*) The sections to be thrown on the screen by means of the projection microscope will, I hope, demonstrate more clearly than verbal descriptions the results of this process. I also pass round a few photomicrographs which I have taken. And here I must express my indebtedness to Dr. F. W. Mott, through whom I have lately had opportunities of working in the Physiological Laboratory of Charing Cross Hospital Medical School.

Slide No. 1 is a transverse section of a canine tooth with pulp *in situ*. It will be seen that there is no shrinkage of the soft tissues, the capillary arterioles and veins retain their normal circular shape, while the layers of odontoblasts are strikingly shown. Their processes are seen extending into the dentinal tubuli in a manner compared by Tomes* to "harp-strings." It is

---

* "Dental Anatomy," 1889, p. 72.

also observed that their dentinal extremities are placed in a line continuous with that of the tubule. These cells are separated from each other, as I have pointed out elsewhere,* by wide visible spaces, which in a young growing tooth are filled with a homogeneous substance and small round cells. This is best demonstrated in embryonic dentine organs. In older specimens, these dento-genetic cells have disappeared from the periphery of the pulp, although they still remain in enormous numbers in its centre, for the production, if need be, of secondary dentine. The fibrillated masses, here seen, show the initial stages of the formation of secondary dentine.

Slide No. 2 is a longitudinal section of a canine. Here the capillaries are cut in a longitudinal manner, and the nerve bundles are seen running alongside the blood vessels.

The third slide is a longitudinal section of a temporary canine.

The next slide shows a portion of normal periosteum attached to the cementum.

The fifth slide presents a vascular canal, containing afferent artery and efferent vein blocked by a thrombus passing from the pulp through dentine to cementum.

Slide No. 6 is most instructive. The section

---

* "On Dentogeny," *Dent. Record*, vol. ix. pp. 337-343.

was taken from an aged canine, and shows in a remarkable manner a fibroid degeneration of the pulp. It is interesting to note that the normal tissues have disappeared. Thus there are no capillaries, no nerves, and no odontoblasts. The penetration of the dentine by the fibres is clearly seen, and in this respect supports the new theory of dentogeny propounded by Mr. Mummery.

In the transverse section it is curious to observe how the centre is occupied by a chain of large areolar circular spaces, which on first sight are blood-vessels cut transversely. This is not so, however, as they possess no definite vessel walls. The recession of the tissues from one edge of dentine is not produced by the method of preparation, but by the fibroid contraction of the pulp, prior to manipulative interference.

The next slide is a longitudinal section of a tooth sent to me by Mr. Holford. It was perfectly sound to all appearances, but frightful neuralgia led to its extraction with several others. It is of great interest, as it shows deposits of secondary dentine nodules in the pulp cavity, and demonstrates one of the modes of termination of inflammation of the pulp. The three stages of formation are here beautifully seen—first, the calcification of bundles of fibrous tissue, going on to formation of dentine with tiny inter-

spaces, and finally the hard solid masses, which are here and there adherent to the dentinal walls. In some places a layer of odontoblasts is still seen on the surface of the pulp.

The 9th slide is a section of polypus of the pulp. This is also another termination of inflammation. It very well shows large, granular cells, somewhat square in shape, with prominent nuclei and nucleoli retained in the meshes of a fibrous connective tissue. The blood-vessels are scanty.

A transverse section through the extremity of a semi-developed bicuspid is now shown on the screen. The pulp is very large, and has but a thin wall of dentine on its surface. The formed but uncalcified layer of dentine beneath the membrana eboris is little, if at all, affected by the decalcifying agents. Observe the small size of the odontoblasts, and the numerous small dentogenetic cells.

A section through an abscess sac, at the apex of the root of a bicuspid, demonstrates very clearly the nature of the connective tissue of its walls, and its mode of attachment to dentine and cementum.

As an example of comparative anatomy the next slide shows sections of the teeth of a hake.

The last section is that of spinal column cut transversely. The cord with its meninges is seen *in situ* in the spinal canal. Externally, bones,

ligaments, and masses of muscles can be clearly made out. It has been embedded in celloidin.

The slides that have been exhibited are by no means perfect preparations; they are merely intended to show a few of the various results obtained by the method. A long experience of preparing, cutting, and staining is necessary before really beautiful sections can be produced. These, however, serve the purposes of illustrating this paper fairly well, and are, I think, of interest.

Gentlemen, in conclusion, let me convey to you my best thanks for your kind attention to my communication, which has, I fear, proved to be far too long, and somewhat tautological; and allow me to express a hope that not only will future trials lead to satisfactory terminations, but that a decided impetus will be given to original research in the sciences of Dental Anatomy and Pathology.

Discussion.

The President said that the hearty way in which Mr. Hopewell Smith's paper had been received testified to the appreciation the Society gave his efforts. Mr. Hopewell Smith's paper had dealt with many points of dental pathology which really went beyond the title of his essay, and so he thought it would be best to limit the discussion to those matters which fell within its range, although he readily admitted their extreme interest, and hoped that they would afford material for further work and future discussion. He observed that several members were present who had devoted special attention to the subject dealt with, and who, further, had been mentioned in the paper, and he hoped that these gentlemen would give the Society the benefit of their views.

Mr. Howard Mummery said he thought they were much indebted to Mr. Hopewell Smith for bringing this process before the Society, as it gave an easily worked method of retaining the pulp in connection with the dentine, many of the specimens showing that this end was very perfectly attained. Mr. Mummery still thought that a successful Weil preparation gives the very best results with material in which hard and soft tissues must be examined together, but he quite allowed that it was a tedious process, although well repaying the time spent upon it. He would like to ask Mr. Hopewell Smith if the layer of tissue between the calcified dentine and the odontoblasts (the layer described by Mr. Tomes as on the "border-land of calcification") was well brought out in his specimens. In most decalcified sections the rounded contours of the advancing line of calcification were imperfectly shown. He could not but think that if prolonged immersion in acids was dangerous,

short immersion was more or less injurious to the tissues. Mr. Hopewell Smith's process appeared to him to be a great advance on all other methods of preparing sections of teeth by decalcification, and would probably prove of great value in microscopical investigations.

Mr. Arthur Underwood said that as far as could be seen or judged from Mr. Smith's very lucid description and the photographs, his process maintained one important point, viz., it retained the hard and soft tissue; but he was bound to say he shared some of Mr. Mummery's doubts, and he also had an old-fashioned dread of the hardening process. All he could say was that Mr. Smith had advanced the decalcifying process by making it more brief. He thought they were greatly indebted to Mr. Smith, who had already done very valuable work in microscopical anatomy, and he hoped his labours in the same field would be even more productive in the future.

Mr. Hopewell Smith briefly replied.

Votes of Thanks.

The President having put the usual vote of thanks to the reader of the paper and the contributors of Casual Communications, announced the next meeting would take place on December 7th, at 8 p.m. Casual Communications :— Mr. C. S. Tomes, "Notes on a Case of Purulent Discharge from both Parotid Glands;" Mr. J. F. Colyer, "A Case of Inverted Eruption of a Tooth;" Mr. R. H. Woodhouse, "Models of the Mouths of two brothers, in which the Lateral Incisors are absent, and the Premolars are in front of the Canines;" Mr. A. W. Barrett, "Models of Two Cases subsequent to the Removal in each Case of Half of the Lower Jaw;" Mr. H. L. Albert, "A Case of Ankylosis of the Jaw remedied by Operation;" Mr. E. Lloyd Williams, and others.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING,

December 7th, 1891.

MR. S. J. HUTCHINSON, M.R.C.S., L.D.S.,

PRESIDENT, IN THE CHAIR.

THE minutes of the preceding meeting having been read and confirmed,

Messrs. FREDERICK CANTON and J. F. COLYER were elected Auditors for the ensuing year.

Mr. H. B. GILL, of Upper Norwood, and Mr. CARL SCHELLING, of Blackheath, signed the Obligation Book and were duly admitted Members of the Society.

Mr. G. O. WHITTAKER, L.D.S., of King's Chambers, 26, King Street, Manchester, was balloted for and elected a Member of the Society.

The following gentlemen were nominated for Resident Membership :—J. E. HARRIS, D.D.S.Mich. and D.D.S., M.S., Univ. of Maryland, U.S.A., 32, Queen Anne Street; J. PERCY SMITH, M.R.C.S., L.R.C.P., L.D.S., 26, Eaton Terrace, Eaton Square, S.W.; E. W. ROUGHTON, M.D., B.S.Lond., F.R.C.S., 33, Westbourne Terrace, W.; PERCY EDGELOW, L.R.C.P.Ed., M.R.C.S.Eng., 7, Old Burlington

Street; MICHAEL Y. WOOLFE, L.D.S., 1, Marlborough Place, St. John's Wood, N.W.; W. H. WHEATLEY, L.D.S.Eng. and Glas., 14, St. James' Road, Victoria Park; and the following gentlemen were nominated for Non-resident Membership:—J. S. AMOORE, L.D.S., 7 Abercrombie Place, Edinburgh; W. PALETHORPE, L.D.S., 83, Edmund Road, Birmingham; E. T. COOKSEY, L.D.S., 26, Marine Road, Worthing.

The PRESIDENT said that it now became his pleasing duty to announce that an old and honoured member of the profession had been recommended by the Council for election as an Honorary Member. To be in accord with their bye-laws, the recommendation of the Council should have been confirmed by an election, but when he mentioned the name of Mr. Thomas Underwood he felt sure that he might be allowed to abrogate the rule by asking them to accept him with acclamation.

The announcement was received with hearty applause, and Mr. Underwood unanimously elected.

The CURATOR (Mr. STORER BENNETT), on being called upon, said that he had received two specimens: one, a three-fanged lower right wisdom tooth, sent by Mr. Jones, of Shrewsbury; the other, given by a student, viz., a crown of an upper bicuspid removed from a lady aged about twenty-eight, who had complained of some neuralgic pain. In the process of examination the point of a fine probe went into a small hole in the tooth, and with the slightest twist possible the crown came off; the crown was the merest shell, and contained a large pulp cavity. The gentleman who operated wished to extract the root, but the lady declined to have anything further done.

The PRESIDENT said that they were very much indebted for the donations. The last specimen was very interesting; the enamel was reduced as thin as a fine sheet of writing paper.

Mr. C. S. TOMES communicated a "Casual" on a case of "Purulent Discharge from both Parotid Glands." The

PLATE III.

FIG. 1.

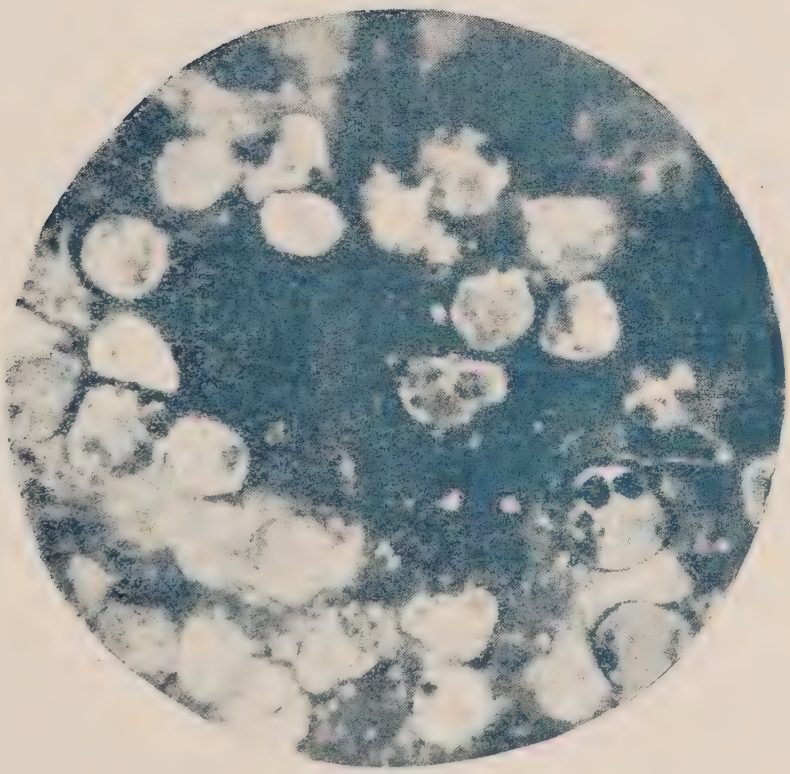


FIG. 2.

patient, a lady, was attacked with typhus in about the year 1856 or 1857. During that attack she had inflammation of both glands, and since that time they had had a tendency to secrete pus. The only inconvenience that the patient suffered was that the mouth was rather dry and sticky. By squeezing the ducts one found that the power of starch conversion was still retained, and looking at the specimen of the secretions shown under the microscope, it was perfectly indistinguishable from normal pus. Mr. Tomes had examined the patient's face carefully, but could not find any trace of a scar. He did not know, and was unable to find a record, of any similar case. It was of over thirty years' duration. He should mention that Mr. Mummery had been kind enough to take photographs of it. The plate (Figs. 1 and 2) shows photographs of the saliva under different magnifying powers.

The PRESIDENT said that Mr. Tomes' case was one of extreme interest, and they were much indebted to him, as also to Mr. Mummery for the photographs. If any Member present knew of any similar case they would be glad to hear of it.

Mr. R. H. WOODHOUSE showed models of the superior maxillæ of two brothers, aged respectively thirteen and fourteen and a-half years. In this family there was a great congenital tendency to the absence of permanent lateral incisors—a grandmother and two aunts, besides other relatives on the maternal side, never having had any erupted. In one of the models shown one lateral incisor was absent, in the other both lateral incisors were absent, and besides this a most unusual irregularity was seen, the canines on both sides being erupted between the bicuspids; the first bicuspids, therefore, being next in position to the central incisors. Mr. Woodhouse thought that probably the absence of the lateral incisors had allowed the first bicuspids to come forward, and the canines coming down subsequently had slid down behind them.

Mr. R. H. Woodhouse also brought before the Society a parallel action bracket that could be used either for working

with gas or the electric light, a globe of water intervening to focus the light and cut off the heat. With gas an Argand burner was used with reflector behind, having a chimney, ten inches in height, to secure a steady flame. With electricity a sixteen or thirty-two candle power Edison lamp was used; the lamp-glass being ground to avoid any shadow being thrown by the filament. A concave reflector was placed at the back of this lamp; the lamp, which could be changed with perfect ease, being supported on an upright square rod, and secured in position by a thumbscrew, the whole working, if necessary, on a travelling horizontal bar. When not in use the glass globe could be removed, and bracket turned back out of the way.

Mr. W. H. Coffin asked if Mr. Woodhouse found no practical inconvenience from the fact that the light moved on a vertical straight rod, and must therefore move out of focus when raised or lowered.

Mr. Woodhouse replied that he found the focal area sufficiently large to make the inconvenience unappreciable.

Mr. Ashley Barrett showed models which he had taken a few days previously, representing the present condition of a girl operated upon twenty years ago for myeloid tumour on the left side of the lower jaw. That side was removed, and it was then found that the right half had a tendency to be drawn in towards the median line. Mr. Barrett endeavoured to overcome this tendency by a mechanical contrivance, but owing to the necessity of its being kept strictly in position both night and day, and the difficulty of attaining that end, it was not very successful. He also showed models of a somewhat similar case of myeloid tumour occurring in the mouth of a girl aged about eighteen or nineteen. The year previous Mr. Mansell Moullin had removed the right half of the lower jaw. The girl asserted that she was unable to masticate freely, and he thought it was evident that the case was the same as in the previous case, viz., that the left half was being drawn in towards the median line. Mr. Barrett was of an opinion that if she lived long enough

her condition would be the same as in the case before narrated. He was very anxious to prevent this condition, but he did not quite see how it was to be done; he thought in the removal of the part of the jaw the operator had left as much of the periosteum as he could, but Mr. Barrett saw no evidence of new bone; the cicatrix was fibrous.

The PRESIDENT remarked that he felt sure similar cases must have come within the notice of members of the Society, and it would be interesting to know if they had been successfully treated, and by what method.

Mr. HERN mentioned that three or four years ago one of his colleagues, Mr. Hulke, asked him to see a private patient for whom he had removed the right half of the lower jaw; the same tendency of the remaining half to be drawn in, which Mr. Barrett had spoken of, existed in this case. The patient was unable to antagonise her teeth. Mr. Hern made two plates completely covering the portion of the lower jaw and the teeth of the upper jaw, and drew the jaw back by elastic bands until he could make the teeth almost antagonise, but not quite. He regretted to say that the patient had a recurrence of the disease for which she was operated upon, necessitating a further operation, under which she died, so that he was unable to say whether his contrivance would have been successful in bringing about the end he desired.

Mr. LAWRENCE READ said that he had a case somewhat similar under his care; the patient came over from Australia to be operated upon. There was an incision made on either side right up to the angle of the jaw; the operation was successful, and the patient then came to him. He made a case in vulcanite, enlarging it from time to time, and finally made a denture, with teeth on it, which, though it did not assist her in eating, prevented saliva coming from her mouth, and improved her appearance and comfort. He had heard since that it was a successful case, and now most of the mastication was done by the tongue, the power of which for such purposes was astonishing.

Mr. Ashley Barrett was obliged to Mr. Hern for the information as to how he dealt with his case, but the difficulty seemed less in drawing back the ligaments than in keeping them there.

Mr. Frank Colyer showed a supernumerary tooth removed from the upper jaw in the region of the first molar. The root erupted first, and becoming slightly rounded off and darkened in the centre, was mistaken for a buccal root. The tooth was slightly tuberculated in character.

The President said that he had seen the tooth, and if any were sceptical they might see that it bore decided marks of attrition. He would remind them that a short time ago Mr. Smale showed a similar case of inverted canine.

Mr. Storer Bennett reminded the members of a specimen in the Museum of an inverted wisdom tooth; he had brought the tooth with him, thinking it might be interesting for them to see it in connection with this case.

Mr. H. L. Albert narrated particulars of a case of ankylosis of the jaw remedied by operation, and exhibited the patient. He stated that in 1881 the patient had an acute attack of rheumatic fever, from which he had recovered, with the exception of a few rheumatic pains from which he had not been free since. About two years after the attack he awoke one morning and found his jaw completely locked — it was a definite case of bony ankylosis of the jaw. He was operated upon by Mr. Howes, who excised the condyle of the left side of the jaw and subsequently that of the right side, and about a month later removed about half an inch below the neck of the ramus. Two years ago the patient came to St. George's Hospital under the care of Mr. Albert's colleague, Mr. Bennett, who soon after decided to excise a wedge-shaped piece of bone just under the ramus. Eleven days later Mr. Bennett operated on the right side. After the operation the central part of the jaw dropped, and all power of swallowing was lost for a fortnight. The patient had regained the power, and

had in fact regained the other movements of the jaw except the lateral. In view of a short discussion which took place earlier in the year when the severing of the ramus was recommended as a better operation than excising the condyle, he thought it might be interesting to bring forward this case.

Mr. C. J. Boyd Wallis said : as electricity is now coming into more general use, some convenient method of adapting the dynamic current to our several purposes is very desirable; with this in view he had designed the current resistance board then exhibited. A switch-board, consisting essentially of four sets of resistances, the first set having six carbons, and the other three sets five carbons to each, each carbon rod was placed in a glass tube, and had a resistance of about twenty-five ohms; the rods were capped with brass screw-pieces, by which they were coupled up for the various purposes indicated on the face plate, namely, a thirty-two candle-power lamp, a throat lamp, motor, mallet, cautery, and medical or induction coils. The thirty-two candle-power lamp acted a double purpose, namely, as a resistance to be used in series with the throat lamp, and as a powerful illuminating medium for special purposes. At the base was a set of six carbons, each of which was of fourteen ohms resistance, arranged as shunts to the other sets. The board was composed of a mahogany frame, a polished slate front upon which were placed the various sockets, the switch safety fuses, and terminals. The glass tubes containing the carbons were placed between thick sheets of asbestos board, and a clear ventilation ran right through the board.

The motor could be worked and regulated by means of the treadle, or independently of it by shifting the plug into the socket below, and bringing into play the use of the shunts, by means of which the motor could be worked at any speed, from a gentle revolution of the armature up to a speed of about 5,000 revolutions per minute. In his own house he had had a special wire laid on to lead current to the board independently of the leads for the house illumination; this

he thought a good plan, for the extra cost was trifling (in his case £2), and a good current was obtained, while the risk of interrupting the illuminating current was avoided.

He was indebted to Messrs. Miller and Woods, of Gray's Inn Road, for the very satisfactory way they had carried out his ideas.

He also exhibited some pure copper foil which is deposited by electricity, and then rolled to the required thickness suitable for filling purposes. In filling teeth with copper amalgam, and capping with a higher grade amalgam, the mercury generally percolates through the surface layer, and more or less discolours it. By lining the cavity with the copper foil, and then filling with a high grade amalgam the advantages of the copper are obtained without risk of discoloration to the amalgam.

Dr. Dudley Buxton exhibited an apparatus devised for carrying and administering nitrous oxide gas and ether in dental surgery. He said that it was very simple, and that there was little new in it, being an adaptation of an old principle. It would be convenient for using in those few cases in which it was advisable and allowable to administer what was spoken of as "a whiff of ether" in dental operations. It was an adaptation of Mr. Clover's apparatus, but so arranged that a minimum amount of ether was employed; it was very portable and easy of manipulation, and consisted of a small ether reservoir holding half an ounce of gas, which was supplied by ordinary tubing and carried straight into the bag direct to the facepiece. When it was desired to have some ether, it was obtained by turning the centre milled nut in one direction so that the gas passed over the ether and became impregnated with it. Dr. Buxton said that, tried with an inhaler, experience would show that half an ounce would give enough anæsthesia, with very little smell of the anæsthetic and very little discomfort to the patient. The credit of making this ingenious apparatus was due to Mr. Ernest Mayer.

The President thought they were very much indebted to Dr. Buxton for bringing the apparatus, and allowing them to see how very portable and compact it was.

Mr. Lawrence Read wished to ask if the apparatus was intended for surgical or dental work, and whether it was intended that it should always be carried? He thought it was most undesirable that carrying ether and nitrous oxide should be made a practice of. Patients would in that way get something they did not think they were having, and under the impression that it was nitrous oxide gas would be liable to attribute any unpleasant symptoms which might be caused by the ether to nitrous oxide, which would obtain a discredit it did not deserve.

Dr. Dudley Buxton, in reply, said that he was exceedingly glad that Mr. Read had made the remarks which they had just listened to, because it allowed him to say what he otherwise should not have thought necessary. He entirely agreed with Mr. Read that *the* anæsthetic for dentists was nitrous oxide, but it had come within his experience that he was not infrequently asked by dentists to give gas and ether, and in these circumstances only would he employ it. He fully agreed that it would be most pernicious to give gas and ether surreptitiously, which to his mind would be practically acting a lie, but he did think that they were justified in giving ether in cases where prolonged operation was necessary. He did not think that it was desirable to give choloroform, and it was with the object to avoid this that the apparatus was designed; he had no idea of palming off either on the dentist or his patient a combination of nitrous oxide and ether as nitrous oxide only.

Mr. Ackery, referring to Mr. Woodhouse's remarks at the previous meeting, with reference to the limit of age to which temporary teeth had been retained, showed a right lower second deciduous molar which he had removed in April of last year for a gentleman then sixty-three years of age. The tooth presented marked erosion and calcification of the pulp and the adjoining permanent tooth. The first bicuspid was similarly worn. Mr. Ackery said this was the greatest age at which he had seen a deciduous tooth persistent, though others might have had more remarkable experience. The patient had, however, the left lower second deciduous molar

still persistent, and as he was a robust man it was still open to him to create "a record."

Mr. Ackery also showed models of a case in which a woman, aged twenty-four, had six retained temporary teeth, viz., the right and left lower canines and right lower second molar, the right upper canine and left upper first and second molars. There were only six permanent teeth present, viz., right and left upper centrals and first molars, and lower right and left first bicuspids.

Mr. Ackery said that within his experience of the absence of permanent teeth it was extremely rare for the first molars to be absent (though in this case the history was not sufficiently clear to enable him to state that they had never been erupted). It was also remarkable in the present case that the lower first bicuspids were amongst the few permanent teeth *in situ*.

The PRESIDENT observed that Mr. Ackery seemed peculiarly fortunate in getting cases of diminution of teeth.

Mr. L. MATHESON, on behalf of Mr. G. Brunton, of Leeds, showed a mandrel for carrying emery discs, for which it was claimed that it was a compact and convenient form for carrying discs, so that the engine might be turned in either direction; the ordinary form of carrier admitted of the engine being turned only in one direction. He also showed new forms of enamel chisels, one for opening approximal cavities in the necessary region for the lingual service.

On a New Method of Moulding and Working Continuous Gum.

By J. Hooton, L.D.S.Irel.

In the old days, when it was the universal custom to use natural teeth for incisors and canines, and blocks of hippopotamus tusk for bicuspids and molars, the process of letting down the blocks was laborious and lengthy, and the blocks themselves were perishable and unclean. Then came the days of imperishable and clean mineral blocks, about which time I commenced my dental education.

These mineral blocks were even more difficult to fit than the so-called bone blocks, and it fell to my lot in those early days to work in this manner. It was also the custom for some of us to experimentalize in the actual manufacture of mineral teeth and blocks.

With this prelude, I may at once state that I have made endless researches for many years to prepare a mineral tooth and gum substance which should neither shrink nor crack in burning. It is needless to expatiate on the labours undergone in this pursuit; suffice it to say, that at last

I found a so-called body which does not crack under the highest heat, and which shrinks hardly at all, and which I have "fired" in half-an-hour. But I am chiefly concerned to-night in describing an appliance designed with the object of moulding the teeth and gum substances in a manner which shall be universally applicable to any form of mouth or gum, and with a series of matrices of different types of teeth it is now possible, by a simple method, to adapt the one to the other by one process.

This process is equally applicable to gold plates or to vulcanite without the need of platinum, which is important, so that either partial or complete sets can be moulded just as easily as vulcanite, and I trust before long to be able to demonstrate that the actual firing shall take a less time than vulcanizing.

I will now proceed to describe the whole process in detail. First of all comes the preparation of the moulds, or matrices. These are made by mounting sets of teeth of various types and sizes in wax, and about seven or eight types are sufficient for ordinary work. These wax patterns, as we will call them, are not fitted to any gum outline, but are simply contoured to the form of an upper or lower maxilla, and are made quite flat on what would be the gum surface; in other respects they are exactly what a set of artificial teeth would be, except as to the gum outline.

These form the male part of the mould, or matrix, which is cast in plaster of Paris in two parts. These parts are trimmed into shape, so as to be reproduced in brass or gun metal in the manner here represented, so as to be clamped together by pins, and on the upper surface a metal plate is cast, like the lid of a vulcanizing flask, except that it has three countersunk holes and a central hole, through which passes a screw, upon which a winged nut works to clamp the whole in one. The outer part of the matrix is hinged in four sections.

The manner of using the apparatus is as follows:—An universal articulator is prepared, and into it is fixed by set screws a zinc model of the case to be treated; upon this is placed a very carefully trimmed wax bite, just of the exact dimensions and outline of the future plate. Around the outside of this is adapted a soft brass plate, which can be roughly moulded to its external outline, and which works on a movable articulating frame, which is removable and replaceable in its exact position. This indicator is adjusted approximately, so that its edge shall be in the same plane as the edge of the bite, and its inner surface is adapted to the outer surface of the bite.

The wax bite is now removed, and a wax counterpart of the inside of the brass mould or matrix most suitable to the case is made by pouring

melted wax into it. This has a flat surface on the gum margin, as before described, and it is adapted to the zinc model by simply heating this sufficiently to run down the wax until its masticating surface is parallel to the edge of the brass guide or indicator. Before the zinc is heated it is needful to remove the articulator, so that it does not get hot with the zinc, but it is replaced in its exact position before the wax counterpart is run down. We have now a wax bite outlined with teeth and gums, just as it left the matrix, but its gum surface, instead of being flat, is an exact counterpart of the zinc model. It is now returned to the brass mould or matrix, and fusible metal is melted and poured in through one of the three holes in the lid, which are countersunk. It is well to put a morsel of tissue paper on the wax, just where the type metal is poured in, so as not to melt the wax unduly at that point. The matrix is quickly opened by withdrawing the pins, and the wax removed.

It is needful now to call attention to the fact that holes parallel to one another have been drilled in the lower part of the matrix, so as to allow of pins being passed through in suitable positions to form the pin holes in the blocks. Slits are also sawn in the mould or matrix, behind the canines on each side, so that strips of thin brass can be slipped in to divide the mould into three parts. Into the pin holes are inserted pieces of steel

knitting pins of pivot-wire gauge, and on to them are fitted the platinum tubes wherewith to line the pin holes in the gum blocks. A plate of copper is put under the matrix, so that the pins will not drop out in the subsequent proceedings. The mould or matrix is now clamped together, with the exception of the lid, and the "body" is packed in in a moist condition, so that it can be shaken down into the mould just like pouring plaster into a wax impression, but it can be packed down and shaken, as it does not set like plaster. The lid is now placed upon it, and hammered down gently and firmly by the handle of a hammer, used endwise, and finally screwed home by the set screw before described as a winged nut. The mould or matrix is now placed over a gas heater, and left until the fusible metal runs out, by which time the water will have been driven out of the "body" substance. The outer part of the mould or matrix and the lid are now removed, and the excess trimmed away from the blocks. These blocks can be removed from the matrix by tapping it lightly and sharply with a hammer, but it is needful of course first to withdraw the steel pins and the brass dividers.

The next step is to paint the gum surface with gum enamel, and to tint the necks of the teeth themselves with suitable colours, if the teeth are required to be shaded, and it is well to do this to

the outside of the gums and teeth before removing them from the mould or matrix. The blocks are now ready to be fired, but it is well to dry them still more by dry heat for half-an-hour before placing in the muffle. The muffle should not be closed until the oil and starch are driven off. Starch is mixed with body compound so that it will work more like clay, and it can be trimmed and adjusted to the bite by suitable "sculptors."

I do not propose to go into the question of firing, because this depends so much upon the form of muffle and upon the gas supply, but I hope to say more upon this on a future occasion. Suffice it to say that with the body compound* this process can be adapted either to complete sets or to partial cases, and for bridge work should supply a very beautiful and simple result. The chief difficulty is in the preparation of the moulds or matrices, but when these are once prepared they will do for any case, and the actual labour entailed in the hands of a skilled workman will produce a result surpassing the ordinary continuous gum, because it can be done in less time than vulcanite work, with a result far surpassing the latter in appearance, and being much lighter than the former.

My invention relates to the manufacture of

---

* This may be obtained ready prepared from S. S. White's.

artificial teeth with continuous gums, and to fitting the same to the mouth of the patient, and the chief object of my invention is to enable a

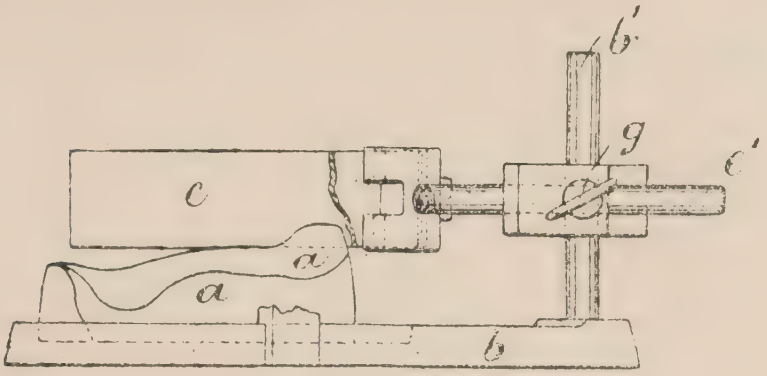


FIG. 1.

whole set, or part of a set, of artificial teeth to be made and fitted to the mouth of the patient

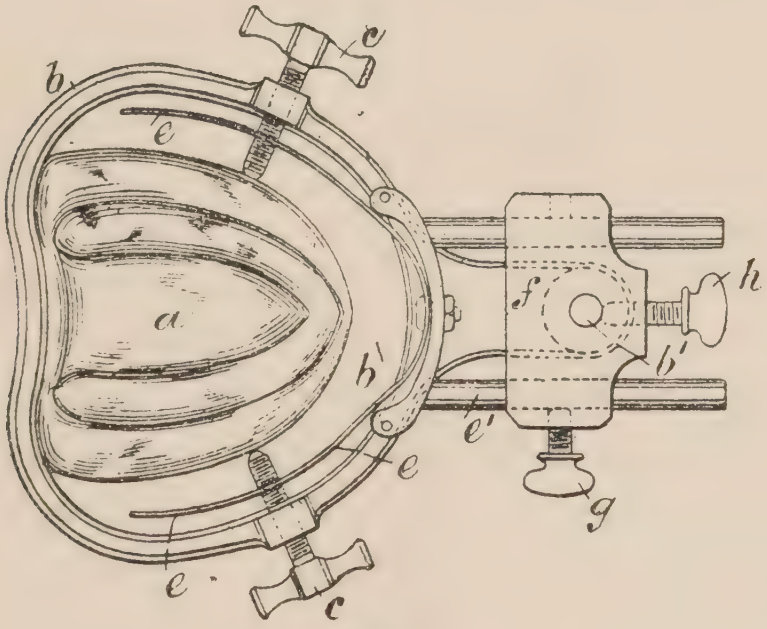


FIG. 2.

by one and the same process. And in order that my invention may be fully understood and readily carried into effect, I will describe the

accompanying drawings, reference being had to the figures and letters marked therein. Having taken as usual an impression or cast in wax of the gums and palate of the patient, and from this prepared a plaster cast in the ordinary or any convenient manner, I prefer to take from this plaster cast a zinc cast (*a*) shown in side view fig. 1 and plan fig. 2. This metal cast (*a*) is then secured on a plate or frame (*b*) by means of the

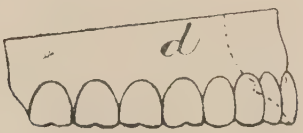


FIG. 3.

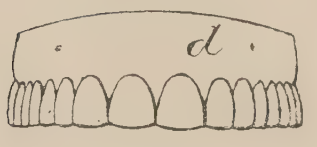


FIG. 5.

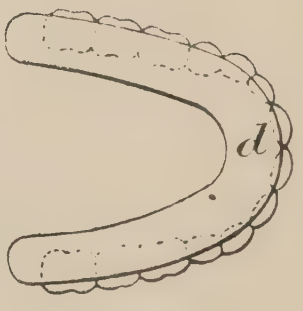


FIG. 4.

thumb screws (*c*) or otherwise. I then take a section or piece of wax (*d*) shown in side view (fig. 3, plan fig. 4), and front view (fig. 5) which piece (*d*) has been moulded in the mould hereinafter explained with reference to figs. 7 to 11, and I heat the cast (*a*) so that by pressing the moulded piece of wax (*d*) upon it the superfluous wax is melted down and an impression of the patient's gums is obtained, and while the wax is still there I adjust or regulate the position of the piece (*d*) by means of a guide consisting of a soft

metal strip (*e*) supported by two rods (*e'*) free to slide horizontally in a block (*f*). When the position of the strip (*e*) has been adjusted to a wax bite, placed on the metal cast (*a*) by sliding the rods (*e'*), the latter are fixed in position by means

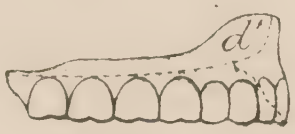


FIG. 6.

of a screw or screws (*g*). The block (*f*) is supported by a standard (*b'*) on which it may be adjusted vertically or axially, and then screwed by a screw (*h*). By means of this guide I am enabled while the wax is melting to adjust or regulate the position of the piece (*d*) to suit the peculiarities of the patient's mouth, such as the

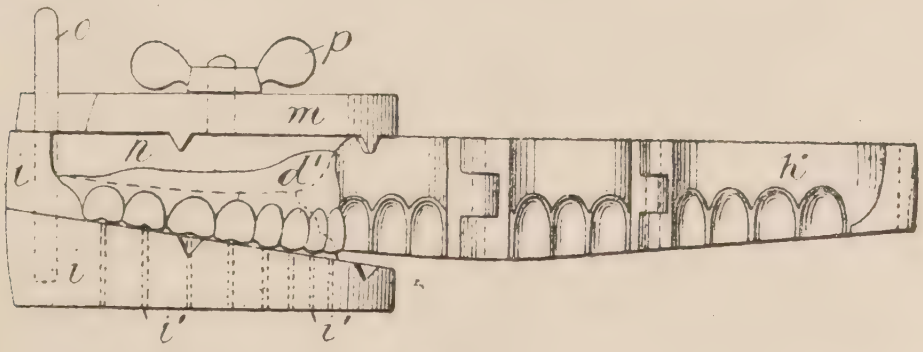


FIG. 7.

angle at which the teeth are set, their length, and the projection of the gums. The finished wax cast (*d'*) (see fig. 6); this obtained is placed in the mould already mentioned as being illustrated by figs. 7, 8, 9, 10 and 11.

This mould, which constitutes an important part of the invention, is of suitable size and represents a complete set of teeth and gums. The mould is made in three parts, namely, the body or main portion (*i*), the front or side piece (*k*), and the top or cover (*m*). The front portion (*k*) is made in four parts, which are hinged together for greater convenience in opening and closing the mould, and when closed the portion (*k*) is secured in position by two pins (*o*). The cover (*m*) has holes or openings (*m'*) in it and is secured to the body (*i*) by a screw and nut (*p*).

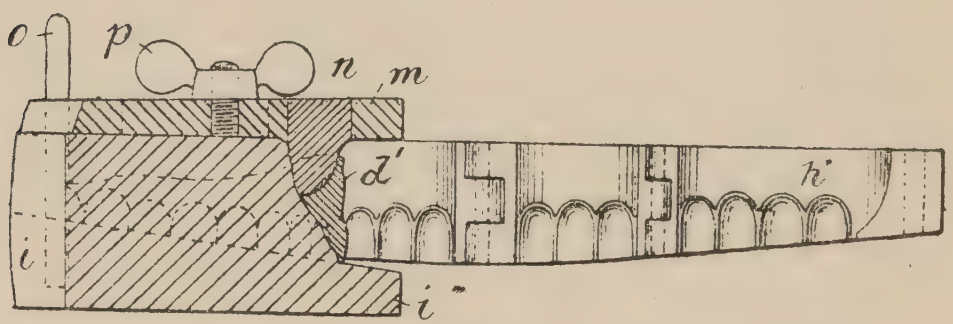


FIG. 8.

The wax cast (*d'*) having been placed in the lower part of the mould, and the mould closed by securing the piece (*k*) and the cover (*m*), I run fusible metal (*n*) through the holes (*m*) on to the wax (*d'*), so as to obtain a correct impression of the surface of the patient's gums. The cover (*m*) with the cast (*n*) adhering to it (see fig. 10) is removed, the mould is then opened, the wax (*d'*) removed, and the mould oiled and the front

part (*k*) again closed ready to receive the composition from which the teeth are to be cast. The artificial teeth are formed by placing a sufficient quantity of this composition in the

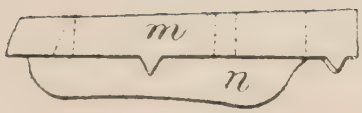


FIG. 9.

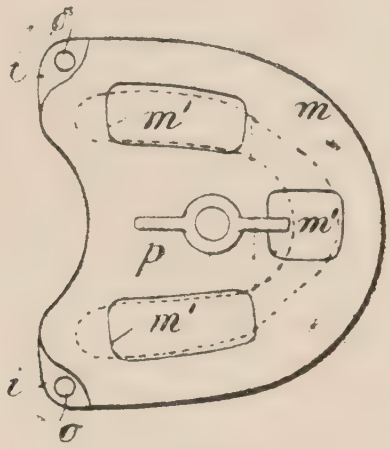


FIG. 10.

mould in a pasty or semi-liquid condition, the quantity of the composition being regulated by the number of teeth required.

In the lower part of the body (*i*) there are a

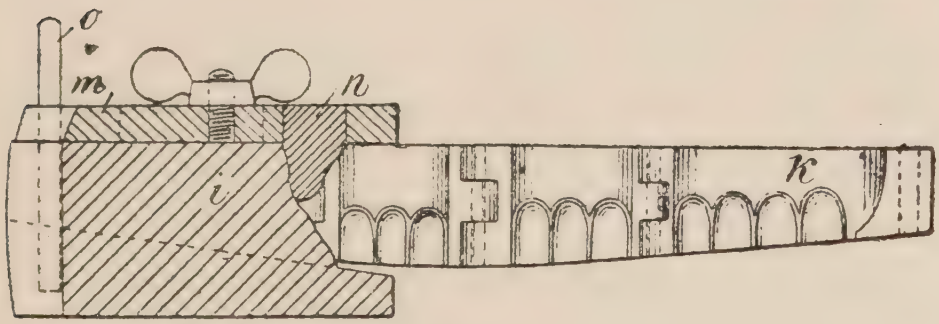


FIG. 11.

number of pinholes (*i'*) shown in dotted lines (fig. 7), one opposite each tooth, and steel pins are passed through all or some of these holes (*i'*) and

project through the mould up to the fusible metal. The pins are cut off close to the mould and are kept in position by a copper disc underneath it. A small platinum tube is passed over the projecting part of each pin previous to the composition being placed in the mould as above described, so that the platinum tubes are embedded in the composition. The cover (*m*) with the cast (*n*) still adhering to it, as shown in fig. 10, is then placed upon the body (*i*), and secured to it by the nut (*p*) in such a manner that the cast (*n*) is pressed firmly down upon the composition in the bottom part of the mould, and the composition is thus moulded simultaneously into the form of a set of artificial gums and teeth (see fig. 8) exactly fitting the mouth of the patient, and agreeing with the finished wax cast (see fig. 6).

The mould is now slowly dried and heated until the fusible metal is melted and runs out when the mould is tilted over. The fine edges of the mineral are thus preserved and an undercut can be obtained. The pins are then withdrawn, leaving the platinum tubes in position. The mould being opened the blocks are removed, and are ready for firing when the gum has been coloured. One firing is sufficient. If the blocks are to be mounted in vulcanite after the firing, pins are inserted into the tubes and made to

project, head downwards, into the rubber, which runs in between the tubes and pins and so affords a secure hold.

In conclusion, I must express my regret that I have not been able to condense my remarks, but the work itself is really much more simple than its categorical description on paper. I should like to say that this process has been a special hobby, and has occupied much of my spare time, and if the profession can gain any benefit by my labours I shall be amply repaid for all my trouble.

Votes of Thanks.

The President having put the usual vote of thanks to the reader of the paper and the contributors of Casual Communications, announced the next meeting would take place on January 11th, at 8 p.m. A Paper will be read by Mr. Christopher Heath, F.R.C.S., on "Epithelioma of the Jaws." Casual Communications:—Mr. H. L. Albert, "Notes on a Case of Unilateral Hypertrophy of the Jaws;" Mr. J. F. Colyer, "On Three Cases of Fracture of the Lower Maxilla;" Mr. A. C. Farnsworth, "A New Impression Tray for Rapid Modelling."

Odontological Society of Great Britain.

THE ANNUAL GENERAL
AND
ORDINARY MONTHLY MEETING,

January 11th, 1892.

MR. THOMAS ARNOLD ROGERS,
HON. TREASURER, IN THE CHAIR.

THE Minutes of the preceding meeting having been read and confirmed,

The CHAIRMAN stated he had, with great regret, to announce that their President (Mr. Hutchinson) was prevented by illness from taking the Chair. Mr. Stocken, Mr. David Hepburn, and Mr. Harding (vice-Presidents) had each been appealed to to fill the place, but were prevented by like circumstances, so that he would ask their kind indulgence for himself.

Messrs. S. A. COXON and J. F. COLYER were appointed scrutators of the ballot for Officers, which was declared open.

The CHAIRMAN announced that Messrs. J. W. SEVILLE (Exeter) and G. O. WHITTAKER (Manchester) having sent their Obligation Forms duly signed, these gentlemen were declared admitted.

Messrs.C.W. CROFT HANDLEY, L.D.S.Glasgow, The Elms, 15, High Street, Stoke Newington, W. (resident); HENRY

Ernest Goddard, L.D.S.Glasgow, Oxford Street, Nottingham (non-resident); and Wm. Draper Moon, L.D.S.Eng., 8, Jesmond Road, Newcastle-on-Tyne (non-resident), were balloted for and elected Members.

The following were nominated before the Society:—Thomas Henry Garland Wrighton, L.D.S.Eng., 7, Bloomsbury Square. W.C. (resident); Charles James Blaaberg, L.D.S.Eng., 2, Argyle Square, King's Cross, W.C. (resident); Arthur Reginald Colyer, L.R.C.P. Lond., M.R.C.S. and L.D.S.Eng., 66, Christchurch Road, Tulse Hill, S.W. (resident); Harry Arthur Forsyth, L.D.S.Eng., 54, Claverton Street, Pimlico (resident); Walter Stanley Holford, L.R.C.P.Lond., M.R.C.S. and L.D.S.Eng., 23, Wimpole Street, W. (resident); Edmund Balding, Jun., L.D.S.Eng., Fairbridge House, 732, Holloway Road, N. (resident); Percy L. Webster, L.R.C.P. Lond., M.R.C.S. and L.D.S.Eng., 2, Redesdale Terrace, Canfield Gardens, N.W. (resident); George Hern, L.R.C.P. Lond., M.R.C.S. and L.D.S.Eng., 18, Stratford Place, W. (resident); Francis Henry Ellwood, L.D.S.Ireland, Granville House, Redhill, Surrey (non-resident); Robert Edward Waller, L.D.S.Eng., Cairo, Egypt (non-resident); Montagu Frank Hopson, L.D.S.Eng., The Croft, Newbury, Berks (non-resident).

The Librarian (Mr. Ashley Gibbings) being called upon for his Report, said: Since our last meeting I have received the *Philosophical Transactions of the Royal Society* containing a paper of Mr. Howard Mummery, entitled, "Some Points in the Structure and Development of Dentine," presented to the Society by the author. Very few books have been added to our library since the date of my last Annual Report. In January last we purchased three new works, but since that time we have been so uncertain as to the accommodation that the library will in future possess, that I have not considered it advisable to recommend any further purchases. Amongst those who have presented books I may mention Messrs. Ash & Sons, Mr. Worsley, and Mr. Trude Fripp, the latter of whom gave us six old books published in the early part of the present century, for

which he received the special thanks of the Society through the President. I hope that during the ensuing year many other members will follow the example of these gentlemen, and that at the next Annual Meeting the Librarian may be able to report that the Library is more worthy even than at present, of the Odontological Society of Great Britain.

The Curator (Mr. Storer Bennett) said that he had little to add to what he had already said with regard to the various specimens, twenty-seven in number, which he had fully described at the time of their presentation, but following the course which he adopted last year, and which seemed to give general satisfaction, he had brought down all the specimens which they had received during the past twelve months and placed them on the table with labels attached fully indicating what they were; he would specially draw attention to the skull of the mummy 4000 years old, which showed that the retention of the temporary teeth was not a condition at all peculiar to the present age.

The Treasurer then presented his Report.

The Reports were duly passed.

Mr. H. L. Albert narrated a case of asymmetry of the jaws:

Alice Barnes, æt. 28.—There was no history bearing on the case until two years ago, when she noticed some stiffness about the left temporo-maxillary joint. Just prior to this she had a tooth extracted and some artificial teeth put in. After the adaptation of the latter she noticed her mouth was drawn to one side. Since then the stiffness and deformity had markedly increased.

The infantile illnesses had been scarlet fever and, to use her own words, "low fever"—the latter possibly being infantile paralysis, it occurring about the age of ten, and leaving her so utterly devoid of muscular power that she was unable to walk for six months without leaning on some one. There had been no injury, no rheumatism and no syphilis. No hereditary history.

The patient brought a photograph with her taken five

Odontological Society's Accounts for the Year November 1st, 1890, to October 31st, 1891.

Dr.	£	s.	d.
To Annual Subscriptions	418	19	6
,, Arrears	60	18	0
,, Entrance Fees	27	6	0
,, Sale of Transactions	5	3	6
,, Donation from the President towards the expenses of the Conversazione to the British Dental Association	100	0	0
	£612	7	0

Cr.		£	s.	d.	£	s.	d.
By Rent					150	0	0
,, Fire Insurance					2	10	6
,, Meetings.	Laing—Carpentering	2	9	6			
	Doherty—Reporters' Desk	5	1	6			
	Bale—Notices, Postage, Stationery	13	2	6			
	Camps—Refreshments	25	17	0			
	Baker—Gas Apparatus for Mr. Caush's Paper	0	12	6			
					47	3	0
,, Library.	Churchill—Books	5	4	4			
	Messrs. Ash—,,	1	10	8			
	Rutterford— ,,	0	12	0			
	Lewis— ,,	0	11	6			
	Year Book of Societies	0	6	0			
	Hersant—Binding	2	9	3			
	Camps—Sub. Librarian	5	5	0			
					15	18	9
,, Museum.	Mr. Storer Bennett—Curator, Sundries	5	15	6			
	Laing—Carpentering	1	0	0			
					6	15	6
,, Transactions.	Bale and Sons	143	6	0			
	Past Presidents' Portraits	9	9	0			
	Engravings for Papers	5	19	0			
	Dr. Dudley Buxton—Sub. Editor	27	18	0			
					186	12	0
,, General.	Tooth—Restoring Portraits and Frames	17	4	6			
	Treasurer's Postage	2	18	0			
	Camps—Gratuity	5	5	0			
	Camps—Sundries	0	14	2			
	Bank Commissions and Cheque Book	0	12	4			
					26	14	0
Conversazione to B.D.A.	Refreshments	54	2	0			
	Lighting, Attendance, &c.	34	1	6			
	Bale—Printing, &c.	14	17	11			
	Zavertal—Band of Royal Artillery	29	8	0			
	Mitchell—Music	12	12	0			
					145	1	5
					£580	15	2

Odontological Society's Accounts—*continued.*

	£	s.	d.		£	s.	d.
Balance, October 31st, 1890	115	13	2	Gross Expenditure, November 1st, 1890, to October 31st, 1891 ..	580	15	2
Gross Receipts, November 1st, 1890, to October 31st, 1891	612	7	0	Balance at Bank, October 31st, 1891..	147	5	0
	£728	0	2		£728	0	2

	£	s.	d.
Gross Receipts for the year, November 1st, 1890, to October 31st, 1891	612	7	0
Gross Expenditure	580	15	2
Surplus of Receipts over Expenditure	£31	11	10

INVESTMENT ACCOUNT.

	£	s.	d.
Amount in 2¾% Consols, October 31st, 1890	3,082	15	8
Dividends, January, April, July and October, 1891, £83 10s. 4d., invested, and producing	86	11	5
Amount in Consols on October 31st, 1891	£3,169	7	1

Examined and found Correct, December 12th, 1891. { F. CANTON, JAMES F. COLYER.

years back. This showed some slight deformity. Patient was a well-formed young woman with good features above the line of the upper lip, well nourished, healthy-looking. The examination of the upper limbs revealed no other asymmetry, and she wears the same sized boots. The face presented a most peculiar appearance, looking as if it had been made in two pieces, with the jaws stuck on at an angle of forty-five degrees, or, to use the words of an artist, if the head were placed in a frame, it would look like the early efforts of an art student. The two eyes were on different levels, but the difference was very slight and apparently increased by the arching upwards of the left eyebrow. Under the left eye was a hard projection traceable to the ear, which was probably the bulging zygomatic arch; below this and in front of the ear was a hard bony projection, in front of which was a depression one could get one's finger into. These might be taken to be the hypertrophied condyle with the sigmoid notch correspondingly increased in size. The condyle extended downwards for $1\frac{1}{2}$ in. The facial surface of the U. L. jaw was protruded, and on passing the finger into the mouth the bulging alveolus became very evident, especially in the bicuspid and molar regions. The lower jaw was pushed over to the right side, so that the chin was one inch from the median line. A corresponding protrusion of the right lower jaw was seen, whilst the articulation of that side was less evident than usual. There was pain on opening the mouth wide, and impossibility of opening it wider than $1\frac{1}{2}$ in. The line of the teeth, both artificial and real, was a line drawn from two inches above the right angle of jaw to the angle of the left lower jaw. No facial paralysis; and perfect power over limbs existed; she had suffered from toothache and swollen face at times in the left lower jaw. The teeth lost had been removed for these affections. There was some atrophy of the left masseter.

Measurements of face:

Root of nose to external angular process ...	R = L
External angular process to ear	R = L
Ear to ext. occipital protuberance	R = L
From ear to angle of jaw	L = 4 in.

From ear to angle of jaw	...	...	...	R = 3	in.
From I. canthus to ear...	...	...	...	L = 5	,,
,, ,, ,,	...	...	...	R = $4\frac{1}{8}$	,,
From I. canthus to angle of jaw		...	...	L = 5	,,
,, ,, ,, ,,		...	...	R = $5\frac{1}{2}$	,,
From symphysis to angle of jaw		...	...	R = L	

The mouth was in a very unhealthy condition, crowded with diseased teeth and roots, most of the few sound teeth being loose and pus secreted round them. The gums were congested and excreting viscid mucus in large quantities.

Owing to the difficulty in opening the mouth, Mr. Albert found it impossible to obtain satisfactory impressions either with or without an anæsthetic.

Teeth removed:

Upper jaw—left side.

Third molar root.—Thickened.

Second molar root.—Thickened, and slightly carious.

First molar root.—Slightly carious; palatine root one-third absorbed; buccal roots thickened and blended at the apices; the anterior buccal root was nodulated nearly as far down as the neck.

Second bicuspid root } —Thickened and irregularly ab-
First ,, ,, } sorbed.

Canine.—Crown perfectly sound; apex of root showed irregular absorption extending to the upper fourth at the posterior surface.

Lateral incisor } —Crown sound, slight absorption of
Central ,, } roots.

Right side.

Central incisor }
Lateral ,, } —Same as left side.

Canine.—Same as left side.

First bicuspid.—Crown perfectly sound, root partially absorbed and considerably thickened at the apex. Roots beyond this, first, second and third molars, irregularly absorbed.

Lower jaw—left side.

Third molar root.—Thickened.
First molar root.—Thickened at apex.
Lateral incisor } —Normal.
Central ,, }

Right side.

Lateral incisor } —Normal.
Central ,, }
Canine.—Normal.
First bicuspid.—Crown sound, slight absorption at root.
Molar root.—Irregularly eroded.
Third molar root.—Slightly thickened, crown normal.

His colleague, Mr. Frost, reported: "L. eye pushed forwards to 2 mm. and slightly raised." The actual diagnosis of the deformity was, to a certain extent only certain, for there was the hypertrophied condyle, but this was not enough to cause the protrusion of the malar bone nor of the facial surface of the upper jaw, nor would it cause the even slight alteration of the level of the eye. Neither could these be accounted for on the supposition that the possible infantile paralysis had in some way retarded the growth on the right side and so a compensating hypertrophy on the left. Nor could it be imagined that in the adaptation of the teeth an incorrect bite would throw the jaw over to one side, much less be attended by hypertrophies anywhere. There were but three conclusions possible, and one of these, general asymmetry, was disproved by measurements. The remaining were some antral growth or hypertrophic changes in the upper jaw, a sort of unilateral leontiasis ossium, involving a secondary and compensating change in the lower jaw.

The Chairman remarked that the case was interesting, and he hoped that it would lead to some discussion. As Mr. Heath was present, than whom there was no better authority in cases of this kind, they should be glad to hear him on the subject.

Mr. Christopher Heath said that although he had come for another purpose, he had much pleasure in respond-

ing to the Chairman's invitation. The case belonged to a class of cases in which he took a great interest. He happened to have with him a copy of one of his own lectures given at the Royal College of Surgeons in 1887, and there they would see the picture of a girl with a deformity very similar in character to the one that had just been brought under their notice; it was a case of hypertrophy of the neck and condyle of the jaw, and Mr. Heath thought there could be no doubt, from the measurements given, that this was the disease that Mr. Albert's patient was suffering from. They had been told that there was a considerable difference (1 inch) between the ramuses of the jaw, and that the condyle of the jaw was considerably enlarged; that would be due to hypertrophy of the condyle. With all deference to Mr. Albert, he thought that relief could only be given by removing the condyle and portion of the jaw; he felt confident that no dental treatment could put the matter right. Mr. Heath drew attention to a drawing on the previous page of the lecture of a remarkable preparation in the London Hospital taken from a dead body; the jaw was examined, and then that very remarkable condition of the jaw was found to exist, there was hypertrophy of the condyle, and a very similar deformity as in his own case. Anyone could examine either of these cases in the Museum of the Royal College of Surgeons.

Mr. Storer Bennett desired to ask if the teeth as well as the portrait were to be presented to the Museum. He might say with regard to the teeth, that although interesting as presenting a considerable amount of absorption, he did not think that they were responsible for the overgrowth on the left side, for the absorption might be seen on both sides, and he could not help thinking that the deformity had no connection with the condition of the teeth.

Mr. S. A. Coxon wished to ask Mr. Albert what advantage he expected to derive from removing the lower incisors? They seemed all of them to be in fairly good condition.

Mr. Albert, in reply to Mr. Bennett, said that he should be very glad if the Society would accept both the teeth and

portrait; he hoped that he did not seem to assert any connection between the absorption and the disease. In reply to Mr. Coxon, he said the removal of the lower incisors was the only way of getting access to the mouth.

Mr. J. F. Colyer read a communication referring to three cases of fracture which illustrated the use of what is known as a Hayward splint.

The first case occurred in a boy, æt. about five, a patient of Mr. Smale's, who was seen at Westminster Hospital. He had fallen from a height of about twenty feet, and sustained a fracture through both canine regions. In addition, the lower lip was much cut, and when first seen four days after the accident, was extremely swollen, adding to the difficulty of the case. When examined under chloroform the fragment carrying the incisor teeth was displaced downwards and backwards, and could be with great difficulty replaced. The teeth were thin and very short. Impressions were taken and a loosely fitting splint made; this was filled in with Gilbert's gutta-percha, and the splint forced into place (chloroform being administered). A fair amount of difficulty was met with in getting the fragment into place, but the case progressed without an untoward symptom, the splint being removed in five weeks.

The second occurred in a female æt. thirty-five, who during a strike meeting acquired a fracture in the left canine region. Attempts were made at first to treat this with an outside gutta-percha splint, but this proved insufficient to keep the fragments in position. When first seen by Mr. Colyer the larger fragment was very much displaced downwards, the bicuspids and incisors in the fragment being very short. In the molar region on either side the teeth were level with the gum. A splint was fixed in position and removed in five weeks, good union resulting, though the canine had to be removed, followed by exfoliation of a small portion of bone at this point.

The third case was that of a man who had been treated fruitlessly by an outside splint for fourteen days. Examination proved that the line of fracture ran in front of the right lower wisdom, the alveolus carrying the first and

second molar being fractured and forced inwards. The displacement of the fracture carrying the wisdom tooth was well marked, being displaced upwards and inwards towards the median line. A splint was made and fixed, the patient progressing very well during the first three weeks, but during the fourth an abscess formed about the angle of the jaw. The splint was removed at the end of the fourth week, when good union had taken place.

In the first case the thinness, slight looseness of the teeth and displacement of the central fragments, and in the second the shortness of the teeth and great displacement downwards of the larger fragment, contra-indicated a Hammond splint, as the tension on the teeth would have been prejudicial.

In the third case a slight addition was made to the splint. The tendency of the bandage in these splints was to slip forwards, and it was at times difficult to keep it in correct position. To overcome this, slight catches were soldered on the splints, one towards the front part of the outside bar, and one towards the extremity, this latter being useful for fixing or spicking on the bandage when pressure was required towards the back part of the jaw. In these splints it was as well, if there was the slightest doubt about getting the fragments back into perfect position, or if the teeth were at all pointed, to make them loosely fitting and fill them with some soft form of gutta-percha. This overcame the difficulties mentioned, and ensured a perfect fit. Another point was to bend the bars upwards so as to prevent the wire rubbing the angles of the mouth, and it was always as well to moisten this part of the wire with some lubricant.

The splint had its advantages and disadvantages, the principal disadvantages urged against it being the discomfort to the patient when lying on the side, and the liability to cause eczema at the angles of the mouth. For these reasons many would prefer a Gunning's splint in the cases recorded. The advantages of a Hayward's splint when it could be used over a Gunning's were, firstly, that it allowed movement of the jaw, and hence more solid nourishment could be taken than with a Gunning, and again, the pressure from the bandage was more evenly distributed than was the case with the Gunning—a most important point.

The Chairman remarked that fractures of the jaw seemed much more common now than they used to be; possibly it was due to the greater amount of machinery employed, and the greater number of accidents arising from it.

The Secretary, for Mr. A. C. Farnsworth, showed a new impression tray for rapid modelling. The tray had a hollow chamber and an inlet and outlet tube, the idea being to fill the chamber with cold water so that the impression might be cooled quickly.

Mr. Walter H. Coffin, without wishing to detract from the merits of the invention or the ingenuity of the inventor, said that he might be pardoned perhaps for mentioning that this form of tray, though neat and convenient, was by no means new; he remembered perfectly well an equivalent to this being used by his father twenty or thirty years ago.

On Epithelioma of the Jaws.

By Christopher Heath, F.R.C.S.

Holme Professor of Clinical Surgery in, and Surgeon to, University College Hospital, Consulting Surgeon to the Dental Hospital of London.

Mr. Chairman and Gentlemen,—I had great pleasure in promising your President to give a paper here to-night, and I can only regret that the illness which is now so common should have laid him up, and prevented my having a colleague of my own hospital in the chair.

Now, Sir, I thought I might say a few words on the subject of "Epithelioma of the Jaws." It is a subject in which I have for some time taken great interest, and I choose it because it has many things in common between the ordinary surgeon and the dental surgeon, for so many cases of epithelioma of the jaws begin about the gums.

We have two varieties of epithelioma affecting the jaws: the common form of squamous epithelioma, which occurs about the lip, face, and principally at the junction of the skin and mucous membrane, and the columnar form of epithelioma. It is only of late years that surgeons have recognised the latter form, *e.g.*, columnar epithelioma of the intestines. We find that the columnar epi-

thelioma development depends on whether the epithelium is originally columnar or not; where you have squamous epithelium you will have squamous epithelioma, and where you have columnar epithelium you will have columnar epithelioma. Now in the upper jaw there is the cavity of the antrum, where you get the best examples of columnar epithelioma; in the lower jaw we have no such cavity, and yet it is remarkable that the researches of Mr. Eve have shown that there is a condition of columnar epithelioma affecting the lower jaw.

Now, having got so far, let us go back to the squamous epithelioma. It is hypertrophy of the epithelium, with a tendency for the epithelium to heap up and burrow down in the deeper structures of the part; and on the surface, wherever there is a squamous epithelioma, we have the characteristic heaping up on the edges, and the eversion of the edges, by which we recognise the disease. We have here (specimen shown) an example of the characteristic rough surfaces of epithelioma from hypertrophy of the epithelium, which would have gone on to ulceration if it had not been operated on.

Mr. Jonathan Hutchinson has shown that it is quite possible to "grow an epithelioma," to use his own language; that is to say, if sufficient irritation of the parts subject to this disease is

kept up, it will undoubtedly produce an epithelioma. Now the best example I know is the classical one of epithelioma of the lower lip. You may see cases of men, and almost invariably men—if a woman suffers it may be taken that she is a smoker addicted to a short clay—having an ulcer on the lip, which in time produces an epithelioma, due to the constant use of a dirty pipe. Another example is the irritation caused by the teeth. I suppose we surgeons see more cases of epithelioma of the tongue due to the irritation of the sharp, ragged edges of the teeth than any other cause; in fact, it is at the side of the tongue that epithelioma of the tongue usually develops. To come to your own special department. If you have a denture which does not fit, and is constantly keeping up irritation, and particularly if it is never taken out of the mouth, ulceration is set up, and by irritation develops into an epithelioma. Now these cases of epithelioma of the gum are pretty characteristic and well marked, and should be recognised at once by their everted edges and excessive painfulness. There is this also to be borne in mind, that the disease dips down into the deeper structures —and this is the very danger, dipping into the gum and so invading the alveolus.

This has an important bearing on treatment. We all know how a surgeon desires to avoid breaking the line of the jaw. I have never seen

a case in which the chin did not go round. I have seen in your own journal cases mentioned where, by some clever mechanical contrivance, the chin has been brought straight, but in my own experience I have found any such method so extremely painful to the patient as to render it impossible of adoption; the muscles on each side begin to contract, and so force the jaw out of place. The point of practice which I want to insist upon is this, that if there is a real epithelioma it is of no use to spare the jaw; if you do so, if you divide and then clip away the alveolus, you will have a recurrence. I believe the right thing is to saw out the piece; anything less, in my opinion, will rarely prevent recurrence. That of course applies to both jaws.

We have, of course, in the upper jaw the disease spreading up along the palate and into the antrum, and frequently further than the antrum. Here is a specimen (shown) of the last case I operated upon, and I want to call attention to the disease being principally on the palate, and spreading from that into the antrum. The man, a soldier, is aged forty-six, and he suffered from this for some time. There were several masses of cancer, both on the hard and soft palates, but no involvement of the orbit; the disease was entirely confined to the cavity of the antrum. I learnt, rather to my surprise, that an operation had been refused

—on what ground I do not quite know. I went very carefully into the case, but could see no reason why it should not be operated upon, and accordingly operated. I had my reward, for I got into the greatest difficulty I ever had in my life, but not in connection with the operation itself. Dr. Dudley Buxton had given the chloroform in his usual skilful manner. There was nothing special about the incision through the skin, but in the midst of the operation we suddenly found that the patient had ceased to breathe. We pulled out his tongue, and used every effort to restore breathing, but without result. I at once performed laryngotomy, and sucked out his windpipe; still no breathing. I then took a pair of forceps, and removed the largest blood clot I ever saw removed from the windpipe; breathing was restored, and I finished the operation. The patient, you will see, has made a very good recovery. You will also notice that the operation was done through a very limited incision from the corner of the left eye. You will observe how very much the disease extends along the palate; more than I have ever seen before. One can easily take away the upper jaw, but I had to take a considerable portion of the soft palate, not quite down to the uvula. So much, then, for a good example of epithelioma spreading from the gums

and palate through the antrum, and it might have gone still further if left.

Now to contrast with that a case of columnar epithelioma. I am sorry that, owing to an accident, I cannot show you the specimen which is in the College of Surgeons' Museum, but it shows extremely well that the disease was entirely confined to the upper jaw. It occurred in a gentleman aged sixty, who first knew that anything was wrong by a discharge from the nose. I don't know whether you are aware that nose-surgery is very much in the ascendant just now—indeed, I should say that there are almost as many nose-surgeons as there are noses; the wonder is that we have any noses left. This gentleman was treated for discharge from the nose, and then treated by his medical man for gum-boil. I went carefully into the case, and I felt sure from the general appearance and the history together that there was very much more serious mischief behind, and that is often the case with supposed polypi, &c. I explained the nature of the case to the patient, and got his permission to remove the upper jaw. I congratulated myself on the fact that the whole exterior of the maxilla was healthy, but on making a horizontal section you will see that the whole of the antrum is filled up with a beautiful specimen of columnar epithelioma, which had pushed its way into the nose. I am particu-

larly sorry that your President, Mr. Hutchinson, is not here, as he fitted the patient up with artificial teeth, but scarcely had this been done when the disease sprang up in the cavities behind the jaw, and eventually destroyed the patient.

Another gentleman came to me lately—all the way from New Zealand—with an ulcer of the skin, and the letter I got said that he had had an operation done out there for this ulcer, but it seemed to involve the bone. Well, I found on examining him that not only was there an ulcer, but that the sub-maxillary gland was enlarged, and there was a distinct growth on the lower jaw. I told him that it was a very serious case, and operated upon him. Now there was nothing special in that, but the point I wish to show you is that the disease did not merely crop up and involve the periosteum of the lower jaw, but that it had gone right into the interior of the lower jaw, and spread between the teeth. I mention it to illustrate the point that you may have epithelioma from above invading the bone, or from below invading the bone, and in either case I do not think you can make too free in removing it.

Then again, you may have epithelioma of the lower jaw following epithelioma of the lip. Now epithelioma of the lip is one of the least active forms of epithelioma, and it is remarkable that after it is thoroughly cut out it rarely recurs, and

when it does, it does not recur in the position of the original disease. In this case (portrait shown) you will notice the scar in the lip on the right side of a soldier under thirty. Two years ago he had an epithelioma cut out of the lip by an army surgeon, and very well done it was; he was quite well for eighteen months, and then seemed to have trouble about his chin. I was written to about the man, who said that he had a carbuncle, and that it had been poulticed, which certainly ought not to have been done. It was a well-marked example of epithelioma, the result of a secondary deposit after the removal of the disease from the lip. Now it involved not only the chin, but also the glands; I was able to remove it by an extensive operation, taking away the whole of the front of the lower jaw, including the bicuspid teeth. The whole of the disease is in front, and nothing less than this operation would have been of any service. I tried years ago in a case of this kind to saw off the bone without opening the mouth, and it looked exceedingly nice for a time; the man was apparently well, but in a year from that time the disease recurred. Now this man is here, and you will see what remarkable coming together of the portions of jaw there is, united by fibrous tissue; I will not say ankylosed. I do not see how this condition is to be prevented. If wedges were put in, the parts would not heal, and moreover,

I do not see how the patient could bear it. On one occasion I had an apparatus made, but the patient was not able to endure it.

There is still a third class of case, viz., in connection with the tongue. Not uncommonly we see a development under the tongue, and here the specimen shows a large ragged ulcer in the tongue involving the lower jaw ; in such a case as that, I do not see that anything can be done except to remove the central portion of the jaw. I need hardly say that it is a serious operation. I have a specimen here, which has been rather spoilt in the cleaning, but which was a most remarkable specimen of extensive epithelioma. The man got epithelioma of the front of the tongue, which was connected with the lower jaw, and infiltrated its tissues. It was one of those desperate cases in which one hesitates to do anything, but the man was in such pain, especially about the occiput, that I divided the jaw, and I put an *écraseur* on, and took away the whole of the tissues beneath the tongue. It was very like the specimen going round, but it was done in a different way. The man made a perfect recovery, and I have seen him from time to time. He turned up last year, and I believe he is still alive, sixteen years after the operation, and so well that one is inclined to think, was it a case of epithelioma? but I have no doubt about it. Here is a case of a similar epithelioma which

involved the jaw, originating in the lip. For this man I removed the lower jaw, but unfortunately he had a recurrence of the disease.

I think, Sir, the principal points that I would venture to bring before you are the necessity for recognising the fact that any irritation may in time produce squamous epithelioma, which when once developed goes much deeper than we should at first suppose. It is most important that any operation should entirely remove it, and not merely cut into the growth. Anything of that kind simply increases the irritation. With regard to the columnar epithelioma, which is not so common and not so frequently recognised in the upper jaw, I think it will be recognised more as men are more alive to it, and bear in mind the fact that what appears to be disease of the nose is very often not disease of the nose at all, but disease of the antrum.

Discussion.

The Chairman said that a more interesting communication it had not been his good fortune to listen to for a long time. Mr. Heath had put the matter so exceedingly clearly before them that they would be able to recognise the nature of these cases when they met with them. It was so many years since he (the Chairman) had practised that he did not feel capable of criticising the paper, but he had listened to it with the greatest pleasure.

Mr. Storer Bennett would like just to endorse, as far as he might, the view of Mr. Heath as to the unsatisfactory results, when two halves of the jaw have been removed, obtained by any attempt to keep them separate by artificial means. Some 12 or 14 years ago one of his colleagues at the Middlesex Hospital had occasion to separate the jaw; he (Mr. Bennett) made an apparatus with two joints and pins for attaching to the side of the portion of the jaw from which the bone had been removed; this kept the two halves apart, and the divided portions were made to work one with the other. For a time it seemed satisfactory, but the parts contracted to such a considerable extent that finally the whole thing had to be abandoned. He had seen similar cases from time to time, but that case came under his own personal treatment and observation, and he thought it would be the experience of most that the parts always contracted.

The Chairman remarked that Mr. Heath was now obliged to leave, but they would agree with him (the Chairman) that they could not allow him to do so without expressing their thanks for his very valuable paper.

A vote of thanks was carried by acclamation.

Mr. Heath desired to thank the members for their kind reception of his paper, which it had been a pleasure to him to give, and he was amply repaid if they had been interested.

The CHAIRMAN called upon the scrutators to report the result of the ballot, and he then declared the following officers duly elected for the year 1892 :—

PRESIDENT.

J. Howard Mummery.

VICE-PRESIDENTS.

Resident : David Hepburn, T. H. G. Harding, R. H. Woodhouse.

Non-Resident : J. H. Redman (Brighton), R. T. Stack (Dublin), F. H. Balkwill (Plymouth).

TREASURER.

Thomas Arnold Rogers.

LIBRARIAN.

Ashley Gibbings.

CURATOR.

Storer Bennett.

EDITOR OF TRANSACTIONS.

Walter Coffin.

HONORARY SECRETARIES.

John Ackery (*Council*), W. A. Maggs (*Society*), F. Henri Weiss (*Foreign Correspondence*).

COUNCILLORS.

Resident : W. Hern, F. Newland Pedley, C. J. Boyd Wallis, F. J. Bennett, Cornelius Robbins, E. G. Betts, Morton Smale, B. J. Bonnell, E. Lloyd Williams.

Non-Resident : W. B. Bacon (Tunbridge Wells), H. B. Mason (Exeter), Mordaunt A. de C. B. Stevens (Nice), T. S. Carter (Leeds), W. S. Woodburn (Glasgow), W. H. Wiiliamson (Aberdeen), H. C. Quinby (Liverpool), D. W. Amoore (St. Leonards), Wilson Hogue (Bournemouth).

In the absence of the PRESIDENT, the SECRETARY read the valedictory address:—

VALEDICTORY ADDRESS.

THE time has now come when I must say a few words of farewell on leaving the presidential chair of this Society, and I feel that my first duty must be to offer a few words of hearty personal thanks, to the members of the Council and of the Society, who have so largely contributed to the success of our meetings, and by their kind support have rendered my year of office one of great pleasure, and have lightened the burden of my great responsibility.

The Council meetings have been largely attended, and it is only right to acknowledge what an enormous power this gives to a President, in the discharge of his duties, for him to feel that he can lay every question of doubt and difficulty before a strong Council, and thus get a vote representing the spirit and tone of the Society.

I feel so strongly in this matter that I must be allowed to thank individually the various officers of the Council who have, one and all, worked with a will to carry us through a year of considerable difficulty and responsibility. Our treasurer, Mr. T. A. Rogers, has been a tower of strength, for his long association with our Society, his loyal conservation of its best traditions, and his unfailing good judgment have indeed been most helpful. Then again, the success which attended our conversazione to the British Dental Association was, in great measure, due to Mr. Ackery's unceasing energy and clever management.

I think we may justly feel satisfied with the numbers who came to the reception in spite of the inclement weather

which prevailed, and which, no doubt, kept away many who would otherwise have been present.

In mentioning Mr. Ackery's name, it is only right to add those of Mr. Maggs and Mr. Henri Weiss, who have each spared no pains to fulfil their duties, and I think the ample supply of papers and of interesting casual communications is the strongest evidence of the thanks we owe to Mr. Maggs.

This past year has been marked by two important events, one of which is the fact that our Curator, Mr. Bennett, has completed the supplementary catalogue of the Museum from 1884 up to the present time. Every specimen in the Museum is classified and numbered, but many numbered specimens are stored away in drawers and cupboards, awaiting the future re-arrangement, or actual moving of the Museum.

The other important event is the editing and arranging the "resolutions of Council," so as to be capable of ready reference by the Council in its deliberations. Few of us can realise what the labours of the sub-committee have been, and our grateful thanks are due to Mr. Coffin, Mr. Gibbings, Mr. Bennett, Mr. Stocken, and the two Honorary Secretaries, for the unremitting labour they have spent on this most useful work.

I am told, upon inquiry, that they have held no fewer than thirty-five meetings, lasting often from two to three hours.

This work was first undertaken by Mr. Rogers and Mr. Coleman, who published the first instalment in the year 1871, and the present sub-committee have, during the past year, continued the work up to date.

The past year is notable, too, for the number of nominations of new members—in fact there are twenty-two before the Council now, which is very satisfactory and encouraging. I always say that there are three things which a man should do as soon as he takes his dental diploma: first, to register; secondly, to join the Odontological Society; and thirdly, to join the British Dental Association and subscribe to its Benevolent Fund!

Now, Gentlemen, I think we may look back with satisfaction on the work that has been done by our Society in the way of papers; for I think we have had one upon nearly every branch of our art. In February Dr. Arkövy dealt with the latest methods of contour and crown-work. Dr. Silk gave us a most interesting and valuable paper on "Bromide of Ethyl in Dental Surgery," in which he proved, very much to our satisfaction, that the strong faith, expressed in my inaugural address, in the value of nitrous oxide was fully justified, placing nitrous oxide in the first rank as an anæsthetic for dental purposes.

Dr. Job Collins read a most entertaining and useful paper on associated and related ocular and dental diseases, in which he effectually destroyed some of our pleasantest and most cherished illusions!

Mr. Pearce Gould added to our store of knowledge by his valuable paper on a fatal case of impacted tooth-plate.

These papers by physicians and surgeons bore strongly on our subject, but the remainder of the session was occupied by papers of a more purely dental nature, and we have to thank Mr. Douglas Caush for a capital account of exostosis, illustrated by some beautiful sections shown by the projection-lantern.

Then Mr. Balkwill, of Plymouth, sent a short paper, the result of much research on morphological dental irregularities, and it is to be hoped that Mr. Balkwill may be able to add to and extend these interesting cases.

Mr. Sewill furnished a paper verifying Dr. Miller's researches in the artificial production of dental caries, also illustrated by the lantern.

A very instructive paper, the result of earnest work, was contributed by Mr. Hopewell Smith, on a method of preparing sections of teeth and bone to show hard and soft parts in combination. This was a very successful demonstration, and will, no doubt, lead the way to many useful discoveries.

Then in December we had an original and interesting communication from Mr. Hooton, of Manchester, on his invention of a method of moulding continuous gum to any case, by means of set matrices, as easily as vulcanite.

And finally at this meeting we have the welcome presence of Mr. Christopher Heath, so well known for his classical work on "Diseases of the Jaws," and above all for the warm interest he has always taken in dental matters, as testified by his position as Examiner on the Dental Board, and as Consulting Surgeon to the Dental Hospital of London; and he has, on more than one occasion before, given this Society the pleasure of welcoming him as a contributor to its archives, as we do once more to-night.

This, gentlemen, forms a good record for the session, and it has also been enlivened by many very valuable contributions to dental surgery in the way of casual communications, and we have had a good deal of light thrown upon the electric lighting of our operating rooms.

I have now dealt with the work we have done; let me now turn to the things we have left undone, and I must refer to my address of last February.

I spoke of the possibility of our Society being called the "Royal Odontological Society," but in the uncertainty as to our future habitation it did not seem opportune to move in the matter at present.

I spoke of the day when every qualified dental surgeon would regard membership of this Society as a higher diploma, but I never said that it could be regarded as a qualification—in fact I look upon it very much as I look upon the R.A., or the R.W.S., or the R.I. for artists, but for us the L.D.S. is the qualifying diploma.

Whilst I am on the question of titles, I should like to say one word upon a very important question, and that is the decision of the Lord Chief Justice and other judges on the use of the title, "Doctor" by qualified medical practitioners.

I am not going to enter into a disquisition on the subject, but I merely wish to say that I hope the day is not far distant when the same law shall be applied to dental practitioners who style themselves "Doctor," when they do not possess a registrable medical degree.

Our ranks have been thinned this last year, both by death and by resignations, and we have amongst others to mourn the loss of a very distinguished honorary member, Professor Wedl, who died in 1891, and of a past-president, the much-lamented Samuel Cartwright.

During the past year your Council has been much occupied with the question of finding new quarters, on account of the notice to leave given us by the Dental

Hospital last May, and here again the Hon. Secretaries, and especially Mr. Ackery, have devoted much time, and trouble, in the search for suitable accommodation. That we have arrived at no definite decision to lay before you, is due to the fact that in December we received unofficial information that the Dental Hospital saw its way to extend its borders, so that for some time at least, we need not seek a fresh abode. But these negotiations are still in abeyance, and we are uncertain as to the future.

It is well to mention that, amongst other schemes, we applied to a famous scientific society to be allowed to share its rooms, and we received a very favourable answer as far as our meetings and our library were concerned, but there would have been no room for our museum.

The Council has had almost endless plans laid before it, and discussed them, but it is useless to take up the time of the meeting now, as they will have to be considered on a future occasion.

I have only to express my earnest hope that some plan may eventually be found, so that the Odontological Society may not have to leave the Dental Hospital of London, and that means may be found to secure a building which shall be amply large enough to hold the Odontological Society, the British Dental Association, and the Metropolitan Branch, with museums and library, under the roof of the Dental Hospital, but at the same time *distinct* from the *hospital* portion of the building, and accessible to all members, and to students of other hospitals.

I am glad to think that my successor in this chair will be one who has done so much good scientific work, and I feel sure that a large measure of success will attend Mr. Mummery's year of office.

Now, gentlemen, in bidding you adieu, I must again offer my sincere thanks for all the kindness I have received, and for the forbearance you have shown to my shortcomings.

All through my year of office I have been impressed by a strong sense of the importance and of the power of this Society, and I can only conclude with a heartfelt wish for its continued prosperity and success!

After the reading of the President's Valedictory Address, the CHAIRMAN said:—

GENTLEMEN,—As in the absence of the President you have placed me in the chair, you will perhaps agree with me that it is but fitting that I should be your mouthpiece in proposing a cordial vote of thanks to him for the valuable services he has rendered to the Society during his year of office. It is a pleasant, and yet a painful duty to perform. I say painful, because we have to part with our President when we have learned thoroughly to appreciate his services, and at a time when those services would be most valuable. It was indeed the unanimous wish of the Council that Mr. Hutchinson should allow himself to be nominated for a second term. But he considered it right to decline—not from any desire to evade the burdens of his office, but from a higher motive. I hope I shall be pardoned by him for telling you that his chief reason was his disinclination to stand in the way of those many members who may justly aspire to hold this office, which has been aptly styled the blue riband of our profession, and who are so fully qualified to hold it. I am sure we shall appreciate this generous sentiment, and honour him for it even more than if he had consented to our wishes. You will remember that last year we did not exercise the option of electing a non-resident President because of the coming meeting of the British Dental Association in London, and the consequent necessity for a resident chief. We all know how splendidly Mr. Hutchinson dispensed the hospitalities of our Society, and

I would most respectfully add, how graciously he was aided by Mrs. Hutchinson. But we did not all know that he not only devoted very much time and thought to these duties, but that he generously contributed more than three-quarters of the expense. He wished, indeed, to defray the whole, but the Council decided otherwise. I think it due to him to mention this, which you would certainly never have learned from himself.

But a far more serious question arose for us last year—the question, and it is a very serious one—whether we may not have to leave our old quarters here and seek a home elsewhere. The matter is still under consideration; but the search for new premises caused the President and the Secretaries incalculable trouble and anxiety. With some knowledge of the work of the Society from its beginning, I think Mr. Hutchinson's labours have been heavier than those of any President since its early days when it was in process of organisation, and in addition was engaged in working out the great educational movement whose results we are now enjoying.

I need scarcely allude to Mr. Hutchinson's conduct of our meetings since, both here and at the Council; we have all seen his thorough mastery of the art of presiding, his knowledge of its duties, his promptitude in decision, his unfailing tact, his unvarying courtesy. Let us hope that his tenure of office has been as gratifying to himself as we know it has been beneficial to us. I have much pleasure in proposing our best thanks to him, and I wish he were present to hear the acclamations with which I am sure they will be accorded to him.

Votes of Thanks.

The usual vote of thanks to the contributors of communications was duly carried.

A vote of thanks to the retiring officers for the past year was duly put and carried. The next meeting was announced to take place on February 1st. Casual communication by Mr. C. S. Tomes, "A Tooth attacked by a Fungoid Growth *post-mortem*." The President will deliver his Introductory Address, which will be illustrated with lantern slides and specimens.

FIG 1.

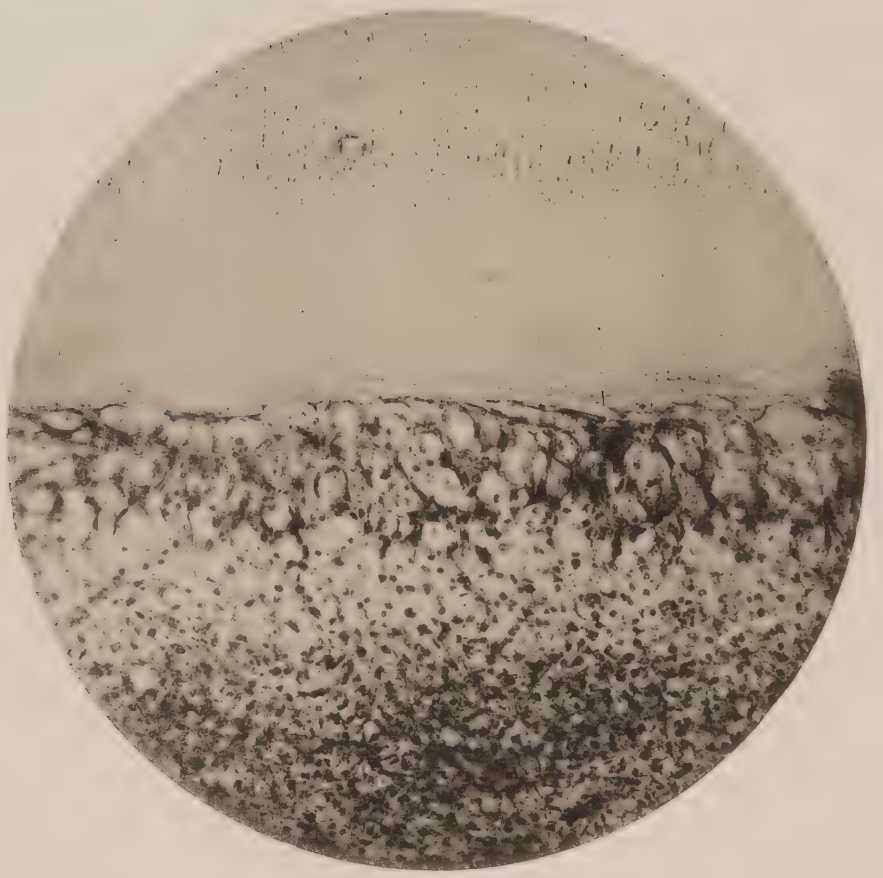


FIG. 2.

FIG. 1.

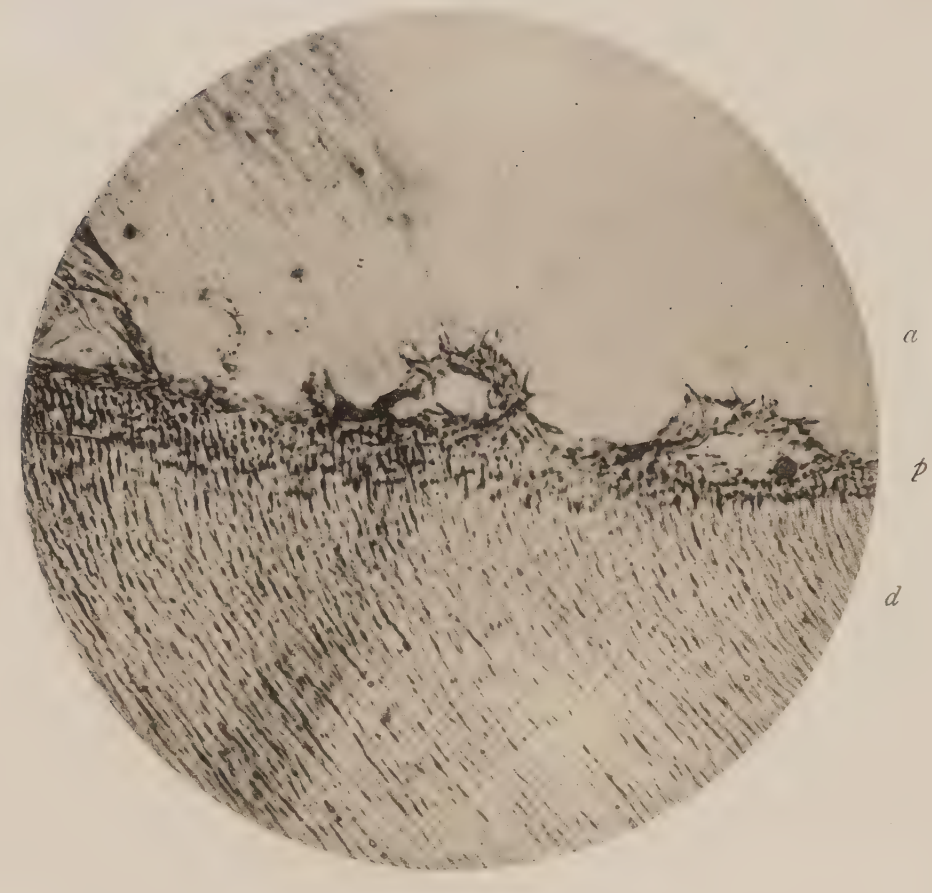
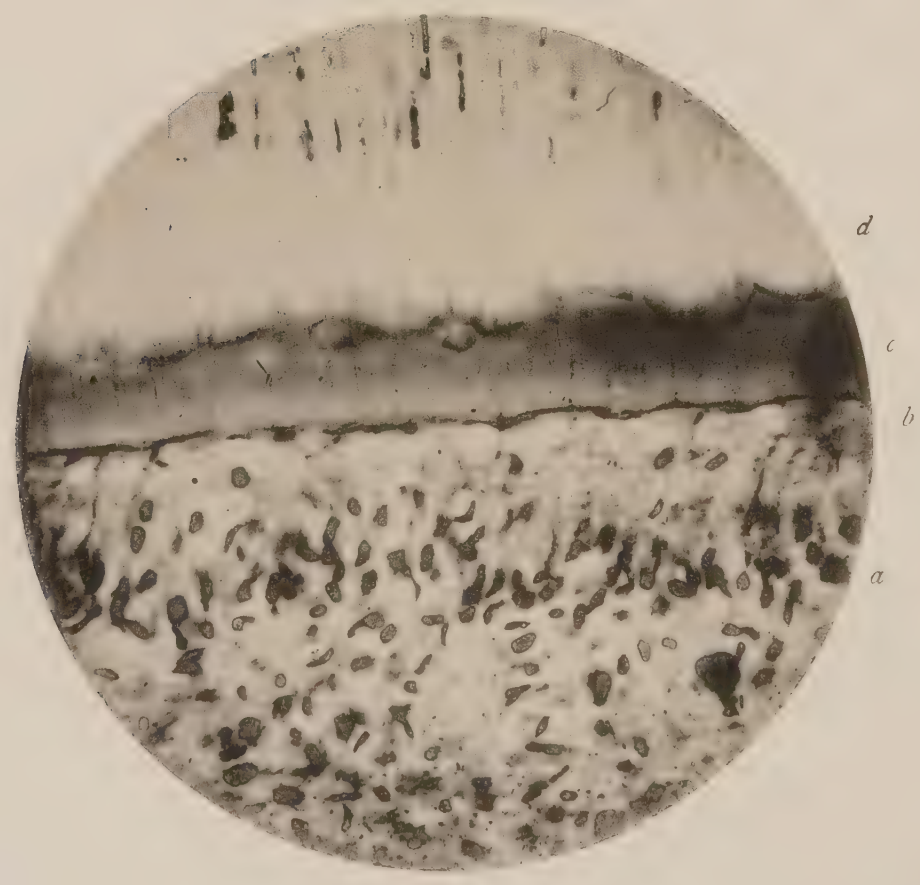


FIG. 2.



DESCRIPTION OF PLATES.

Plate I. Fig. 1.

Human bicuspid tooth. Longitudinal section. Processes projecting from the dentine at the margin of the pulp cavity (pulp torn away).

(*a*) Pulp cavity.
(*p*) Processes.
(*d*) Dentine.

Fig. 2.

Human bicuspid tooth from young tooth near uncompleted apex of root.

(*a*) Odontoblasts not fully in focus.
(*b*) Showing the blending of the connective tissue of the pulp with the layer (*c*).
(*c*) Layer of yet uncalcified matrix crossed by the tubes.
(*d*) Dentine.

(The negative also shows striation in the dentine at (*d*), but this cannot be shown in the reproduction as it would necessitate the whole being too deeply printed to show other details.)

Plate II. Fig. 1.

Dentine of rat's incisor.

(*a*) Pulp.
(*b*) Connective tissue.
(*c*) Passage of fibre bundles into the dentine and striæ in the calcified portion.
(*d*) Dentine.

Fig. 2.

Vaso-dentine (Hake).

(*a*) Pulp.
(*b*) Blood-vessels.
(*c*) Connective tissue layer.
(*d*) Dentine.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING,

February 1*st*, 1892.

Mr. J. HOWARD MUMMERY, M.R.C.S., L.D.S.,

President, in the Chair.

The Minutes of the last meeting having been read and confirmed,

Mr. C. W. Croft Handley having signed the Obligation Book, was formally admitted a Resident Member by the President.

Mr. Josiah Mansbridge, L.R.C.P., M.R.C.S., L.D.S. Eng., of 112, Harley Street, W., was nominated for Resident Membership.

The President then stated that the Council had nominated for Honorary Membership Mr. Christopher Heath, F.R.C.S., and it was in order for him to ask the Society to confirm the Council's nomination, and proceed at once to the election of Mr. Heath.

Upon this being put, Mr. Heath, F.R.C.S., of 36, Cavendish Square, was unanimously elected an Honorary Member.

The following gentlemen were balloted for and elected Resident Members:—J. E. Harris, D.D.S.Mich., D.D.S. and M.D. Univ. of Maryland, U.S.A., 32, Queen Anne Street, W.; J. Percy Smith, L.R.C.P., M.R.C.S., L.D.S.

Eng., 26, Eaton Terrace, Eaton Square, S.W.; E. W. Roughton, M.D.Lond., B.S.Lond., F.R.C.S.Eng., 33, Westbourne Terrace, W.; Percy Edgelow, L.R.C.P.Ed., M.R.C.S.Eng., 7, Old Burlington Street, W.; Michael Y. Woolf, L.D.S.Eng., 1, Marlborough Place, St. John's Wood, N.W.; W. H. Wheatley, L.D.S.Eng. and Glas., 14, St. James' Road, Victoria Park; and the following gentlemen were elected Non-resident Members:—J. S. Amoore, L.D.S.Eng., 7, Abercrombie Place, Edinburgh; W. Palethorpe, L.D.S.Eng., 83, Edmund Street, Birmingham; E. T. Cooksey, L.D.S.Eng., 26, Marine Road, Worthing.

The Curator (Mr. Storer Bennett) stated that he had received an extremely interesting donation to the Museum from Mr. Oswald Fergus (Glasgow). The specimen was a left upper lateral root, on which a tube tooth had been crowned—pivoted, as it was formerly called—in 1840, fifty-two years ago. The crown was seen to be quite firmly attached to the root, and it was interesting to notice that a narrow margin of enamel was left on the palatine side of the root, in a manner that would now-a-days be considered very unsafe. The root, which gradually loosened and was finally dislodged in eating, was encased at its upper half in a thick layer of hard, brown, nodular tartar. The corresponding tooth on the opposite side of the mouth contained a gold filling on its palatine surface at the margin of the gum, and this was inserted by the same operator—a dentist in Glasgow—fifty-nine or sixty years ago. The condition of the other teeth was wonderfully good for one so advanced in years as was this patient.

Mr. Tomes showed some sections cut from a tooth picked up in a churchyard, which had presumably been buried for a number of years, and had ultimately found its way up to the surface. The chief interest attaching to it was that the dentine was to a very large extent tunnelled by borings of uniform diameter, which could hardly be due to anything other than a fungus. Mr. Mummery had suggested that its manner of growth recalled that of some of the moulds. In

FIG. 1.

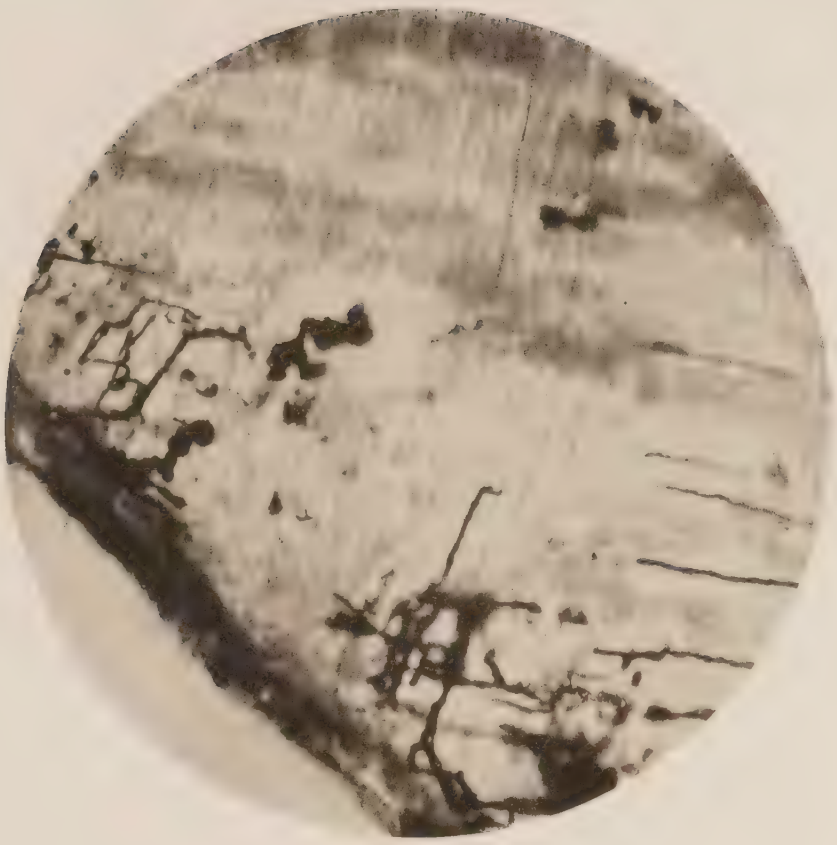
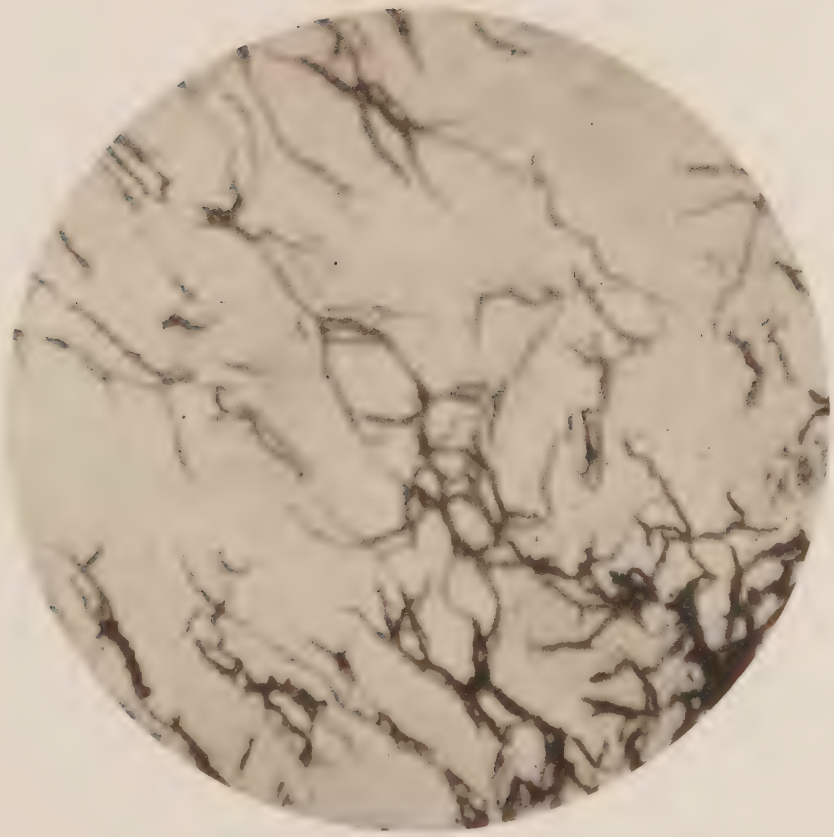


FIG. 2.



many places the borings followed two directions, more or less at right angles to one another, the one being along the dentinal tubes, which are greatly but uniformly enlarged by it, and the other along planes corresponding to those incremental layers along which disintegrating dentine so often breaks up. Where the dentinal tube was traversed, the enlarged portion passed abruptly into that which was unchanged, so that the idea of a mere chemical solvent creeping down the tube was negatived. And although its usual course was along lines which might be regarded as those of least resistance, it was perfectly capable of drilling the dentine in any direction whatever, as is seen in the second illustration, in which the borings run in all directions, quite irrespective of the tubes or the lines of growth. This fact has a bearing upon the phenomena of caries. We are in the habit of supposing that the micro-organisms of caries do not do any direct work in softening and tunnelling the dentine, but that they cause fermentation changes in mucus, food, or what not, and that the decalcifying acid is derived from these sources. Such may still be the right view, and indeed the borings exhibited do not bear any close resemblance to the phenomena of caries, but nevertheless these sections prove that a fungus can, unaided, or aided only by the decomposition of the organic material present in dentine, drill it freely in any direction.

Photographs of the sections taken by Mr. Mummery were thrown upon the screen, and the illustrations are printed from photographs taken by Mr. Mummery and Mr. Tomes.

Mr. Storer Bennett asked where the tooth was picked up, and at what date.

Mr. Hern inquired whether there was any evidence of the presence of caries in the tooth, and if so, whether any connection appeared between it and the tunnelling to which Mr. Tomes had referred.

Mr. Tomes replied that the tooth had been found in the graveyard of a very old church in Warwickshire. There was Norman work in the church, so it was possible that

the tooth was of a great age. There was no caries, or at least there could be no question of the fungus having spread from it, for it (the fungus) was not found most abundantly where caries would occur, but in the roots of the tooth. The main interest of the specimen was, of course, that the tunnelling or borings had occurred out of the mouth, and so out of the possible area of action of acids which were usually supposed to effect such decalcification.

The PRESIDENT then delivered his Inaugural Address, which was illustrated by lantern slides and specimens placed under microscopes.

MR. TOMES' "CASUAL." DESCRIPTION OF FIGURES.

FIG. 1.

Portion of dentine and cementum. The borings of the fungus are seen to chiefly follow the lines of the dentinal tubes, or lines, roughly speaking, at right angles to them. The round dots are probably not spores, but borings cut transversely. The photograph shows lines of rounded forms along the lines of increment, especially on the right of the figure, the nature of which is not clear, but which may be due to decalcification around the track of the advancing fungus.

FIG. 2.

In this figure the dentinal tubes have not come out distinctly, but their direction may be made out on careful inspection, and the borings of the fungus are seen to have no relation to them.

PRESIDENT'S INAUGURAL ADDRESS.

Gentlemen,—My first duty in appearing before you to-night is to thank you for the great honour you have done me in electing me to the important post of your President. While well aware of the many deficiencies which render me but little fitted for the position, coming as I do after much more competent predecessors, I will only say that I will make every endeavour to keep up the traditions of the Society, and to render this year, as far as it lies in my province to do so, worthy of those which have gone before.

I must confess that this sudden elevation to such an important position comes upon me rather as a shock—it is a strong reminder of the advance of time. A President of your Society can no longer look upon himself as among the junior members of the profession, but must, burdened with the dignity of his office, consider himself in the light of a senior.

It is frequently by a sudden impression that we are brought to see ourselves in a new light, and I have a distinct recollection of that sudden impression coming upon me when listening to the introductory address at the opening of the medical session, delivered by a friend and fellow-student of mine. I sat again among the students who, as is the way of students (medical perhaps especially) were filling up the time before the lecture by pelting an immovable reporter with paper balls.

When my friend and contemporary appeared in his graduate's gown, and gave much valuable advice to the youthful audience, I suddenly realised that I was his contemporary, not theirs; so it is that to-night, the dignity

you have conferred upon me has given me a still clearer perception of the responsibilities of age.

The Session which commences this evening will, I hope, be marked by profitable discussions and by some well thought out papers from our own members. While fully acknowledging the value of casual communications and descriptions of cases in practice, I think a well considered paper on some subject which the contributor has sought to make thoroughly his own, is of great value; it not only brings together scattered material which otherwise might be passed over, but it affords an opportunity for discussion and criticism, which tend to eliminate errors and advance more accurate knowledge.

Papers from others who are not members of our special branch, while they certainly ought not to take the place of members' communications, serve nevertheless a very useful purpose in opening up subjects which have a more or less important bearing upon our work, since there is a danger that in following the very distinctly marked lines of our daily practice we may somewhat narrow our ideas. I think it will be acknowledged that it is highly important for the dental surgeon to keep up as wide an interest as possible in other branches of surgery and medicine, and also in the kindred subjects of physiology and histology. If he undertakes any special line of research he can then do so on a broad basis, his conclusions will be more sound and the benefit from his work more general. Professor Huxley said in one of his addresses, "The man who works away at one corner of Nature, shutting his eyes to all the rest, diminishes his chances of seeing what is to be seen in that corner."

There is a tendency with some to separate the so-called "practical" from the "scientific." Surely this rests upon a mistaken understanding of both terms. The practical man avails himself of the discoveries of science; and is not the pursuit of science merely the endeavour after more com-

plete knowledge, without which successful practice is impossible? The practical man who ignores the scientific method, is very apt to fall into empiricism and to draw false conclusions from appearances which are misleading. Science and practice should go hand in hand.

It may seem to us sometimes that the investigation of subjects connected with our own profession is well nigh exhausted; but this can only be from our taking a too superficial view of the case. This was excellently put before us in the opening address of our former President, Mr. Charles Tomes, and it so impressed me at the time, that I venture to quote it here, as important for us all to remember.

"In the pursuit of every branch of knowledge there comes a time when that which lies upon the surface, patent to casual intelligent observation, has been worked out, and when, for further progress a closer and deeper investigation becomes essential. I venture to think that if that closer investigation, with the aid of modern methods of research, were applied to our special problems, a sufficiently rich harvest of results would reward the effort."

Let us indulge a little in "the unfashionable sin of enthusiasm," and as our special tastes incline us, take up special subjects of study, and the results will be satisfaction and pleasure to ourselves and the advancement of the profession as a whole.

Above all, let us not as we grow older, cease to learn; let us if possible, avoid that partial paralysis of the intellect that creeps on men with advancing years, a tendency to think that facts learned, and knowledge attained in our youth and prime, were final and complete, and an unwillingness to admit the bearing of new observations on our stereotyped knowledge, as if the world had not advanced as we have grown older.

The late Mr. James Hinton, equally well known as a philosopher and a surgeon, says: "Nature is ever

misunderstood at first, and most by those who most earnestly study her. Did she not show us as plainly as it was possible to put the thing, the earth going round the sun; and did not we, for ages, think that she meant that the sun went round the earth? we could not help it, and she has had most pathetic patience with us,—she has only said, 'Look again, see this fact, how can it be as you think?' and when we put that wrong also, she has said again, 'Look here.' Fact after fact she has tenderly laid before us, until at last we could not but see it as she meant it. Hers is the true scheme of education."

In my address to you to-night, I am departing somewhat from the accustomed routine, and hope it will not be looked upon as an innovation if I make this address of a special nature, dwelling upon a subject which has absorbed my attention much of late years, the structure and developmental relations of dentine. I have I think a good precedent for this course in the opening address on an embryological subject, delivered by our esteemed Treasurer on the occasion of his second Presidentship.

My views on the subject of dentine, have, as you are aware, been already published in the Philosophical Transactions of the Royal Society for 1891, and in my communication to-night I propose to dwell shortly upon the evidence in support of these views and on the relations of dentine to the other tissues of the body. If I seem to have ventured upon theoretical ground, I must defend myself at the outset from the possible accusation of being wedded to any theory.

Mr. Hinton, whom I have quoted before, likens the work of science to the unravelling of a tangled skein of silk. He says: "A tangled skein is tangled or obscure and wrong, only in relation to *us*; it came so by no accident; we must start with the conviction that it can be disentangled—we must be patient, never on any account apply force, to pull it is the worst of all things, we simply examine gently how

it is, but if it is anything of a tangle we cannot do this directly—what we have to do is to make a theory of it, to arrive so at a representation, we lay the various threads out one by one in clear and distinct relations, the best way we can see according as the thing *appears*. Then this theory at last reveals the real case, we interpret it. First we look and see what the various threads are (observation), then we arrange them according to our ideas and their appearances (theory), then we see how they really go (interpretation), which reveals to us the fact of the matter and the tangle is unravelled."

Thus we see that a theory—a very dangerous thing wrongly used—is a desirable and necessary adjunct to any investigation taken up on broad lines—the scaffolding on which the edifice is reared.

The theory may be only partially right, but, rightly used, may lead to true results.

Darwin, in one of his letters, says : " Without the making of theories I am convinced there would be no observation."

My late investigations have been but a humble attempt to unravel a little piece of the tangle (and we must acknowledge that the anatomy and development of the dentine is a very considerable tangle), but I venture to hope that this attempt may lead to an interpretation of the subject more in accordance with the general laws that govern the structure of the tissues of the body, and for that reason, perhaps, likely to be nearer to the truth.

Before proceeding to the special subject of dentine, I should like to remind you of the views of bone structure and development at present held, as an introduction to the special subject before us, and as illustrative of several points which I wish to dwell upon.

The investigations of Professor Sharpey showed clearly that bone is made up of lamellæ, consisting of transparent fibres " decussating with each other in the form of an ex-

ceedingly fine network." These transparent fibres, rendered visible after decalcification of the bone with acids, are, according to the recent researches of Professor v. Ebner, made up of finer fibres corresponding in character with bundles of white connective tissue fibres. Other bundles here and there pass obliquely between the lamellæ. The layers of bone are also, as demonstrated by Professor Sharpey, bolted together by other bundles of fibres, also corresponding in chemical composition to white fibrous tissue. These last are the penetrating fibres of Sharpey.

We have, then, in bone the "decussating fibres" forming the groundwork in which calcification takes place, and the penetrating fibres. The "decussating fibres" are, according to v. Ebner, doubly refracting, and are not themselves calcified.

In speaking of the development of bone, I will not touch upon intra-cartilaginous ossification, as it is now well established that, at all events in most cases, this is only provisional. It is replaced later by subperiosteal bone, and by the concentric lamellæ formed around the Haversian canals.

Treating first of intramembranous ossification as exemplified in the bones of the cranium, if we examine the parietal bone when ossification has already commenced, we find a mass of bone in the centre, and spiculæ radiating from it in all directions. These bony radiating spicules are seen under the microscope to be continuous with bundles of fibres, the osteogenic fibres, extending beyond the circumference of the formed bone. These osteogenic fibres are identical in chemical composition with white connective tissue fibres, and are described by Gegenbauer as in some situations directly continuous with connective tissue fibres. They are covered with large granular corpuscles, which also fill up the interstices between them. In the last edition of Quain's anatomy, Professor Schäfer says: "The earthy deposit occasionally

appears in an isolated patch here and there on some of the osteogenic fibres in advance of the main area of ossification." Professor v. Ebner considers that the fibres composing these prolongations are not themselves calcified, the uniting substance only being impregnated with the lime salts. We see then that in this form of bone development, bundles of fibres, clothed with cells, project from the surface of the already completely calcified tissue. On the long bones, where the chief addition to their substance takes place, beneath the attached periosteum on the outer surface of the bone, we see an arrangement of tissue elements in many respects similar. Applied to the surface of the bone is a very distinct layer of large granular corpuscles, the osteoblasts. These cells are in direct contact with the bone, and occupy the intervals between bundles of fibres of the periosteum which pass deeply into the osseous substance. The arrangement of the fibres in bundles is here very marked, and also their continuity with the connective tissue fibres forming the periosteal membrane. Here, as in membrane bone, the bony spicules are prolonged by bundles of osteogenic fibres. The fibres which passing from the periosteum enter the bone and pass deeply into its substance, persist as penetrating fibres except where the advance of the concentric lamellæ formed around the Haversian canals has absorbed them and cut them off, for these fibres are not seen in the Haversian systems.

In the peridental membrane we meet with similar appearances—bundles of fibres from the pericementum enter the cement and persist as the penetrating fibres of Sharpey in that tissue—and occupying the intervals between the bundles we find cells, the osteoblasts or cementoblasts.

By some it is considered that the osteoblasts are directly converted into bone, some cells escaping calcification as the lacunal cells, which become surrounded by the

consolidated osteoblasts forming the matrix of the bone. According to other authorities the osteoblasts elaborate the osteogenic substance, not being themselves converted into bone. If it is the case that the protoplasm of the cell is directly converted into bone, we ought, as pointed out by Prof. Schäfer and others, to see the outline of the cell areas in the completed tissue—but this cannot be demonstrated, nor can an osteoblast be seen partly converted into bony substance, but if the conversion view be correct, surely such cells should be met with.

Turning our attention now to dentine we find that it has been set apart among the tissues of the body as a peculiar substance not formed on the plan of the other tissues, but standing alone in its mode of development.

Two different theories, as in the case of bone, have been held by leading histologists, which may be also described as the conversion and the secretion theories. According to the former—that familiar to us as students of Mr. Tomes' "Dental Anatomy," and held by Prof. Waldeyer and others in Germany—the odontoblast cells are converted into the matrix of the dentine and the sheaths of Neumann, by direct calcification of their substance, processes from these cells remaining uncalcified as the dentinal fibril. According to the contrary view—that of secretion—the odontoblasts secrete a substance which by calcification becomes the matrix. This view, with modifications, is held by Prof. Kölliker, Baume, and others.

If the odontoblast cell is converted into dentine by actual alteration of its substance, this must take place in three different degrees; very little, if any, change taking place in the fibril, a peculiar condition being brought about in the part of the cell which forms the sheath of Neumann, rendering it peculiarly resistant to the action of acids, and the rest of the cell becoming converted into the hard substance of the matrix.

As the portion towards the already-formed dentine is used up, the cell maintains its integrity from beneath, so that from the commencement of calcification to its completion, one cell only is engaged in forming the whole depth of the dentinal substance in and around one tubule. It is considered that a slow diminution of the calibre of the tubule by a gradual process of calcification of the periphery of the fibril constantly takes place during the life of the tooth.

In a contribution to a discussion in *Nature* on Weissmann's theory of heredity, Professor Cleland made use of this view of the persistency of the odontoblast cell as an illustration. He says (*Nature*, vol. xli., Feb. 1890, p. 392): "Every anatomist is aware that the living elements of dentine are nucleated corpuscles with elongated branches which are embedded in the matrix, and lengthen as the dentine increases in thickness, while the corpuscles themselves retire inwards, remaining at the boundary of the lessening pulp cavity. The continuity of the tubes containing these fibres furnishes, as soon as one thinks of it, convincing proof that they are the same branches and the same dentine corpuscles which are found when the dentine begins to be deposited and when it is completed. But the dentine begins in childhood, and may go on increasing in thickness in old age, with its tubes still continuous, though losing their regularity of position. Therefore dentine corpuscles continue alive and without division during the greater part of the life of the organism."

I cannot but think that the odontoblast is a rather hardly used cell; it has not only had to persist during the whole active life of the tooth, but has had to form the soft fibril, the investing tubule, and the matrix of dentine, and in addition to all this is considered by many to act as a nerve-ending cell and conduct sensation to the dentine. This latter function is hardly, I think, consistent with its

other offices, and with what we know of the action of cells in other parts of the body. This anomaly struck Mr. Hopewell Smith, in a paper on development, to which I have referred elsewhere, and he would rather consider the function of the odontoblast to be wholly sensory, the cell really being a nerve-end organ and compared by him to the ganglion cells of the spinal cord, other cells than the odontoblasts being concerned in the formation of dentine. In this case, however, one would expect to find very considerable nerve filaments entering the odontoblasts, and it is also remarkable that in old teeth the odontoblast layer appears to be absent. Professor Kölliker considers the growth of dentine to be partly by conversion and partly by secretion, and that while the central part of the cell persists as the fibril and tubule, the matrix is a secretion from the odontoblasts and other cells of the pulp. Baume holds that the calcification of the dentine takes place in a material secreted by the odontoblasts.

Concerning the relations of the fibril to the pulp, much further investigation is still called for. Professor Klein describes the dentinal fibril as arising not from the odontoblast at all, but from a separate layer of deeper cells. With the more perfect means now at our disposal for the examination of dentine in its natural relations to the pulp, it is still very difficult to decide as to the origin of the fibril in mature teeth. In many specimens of the teeth of embryos the processes can be plainly seen to arise from the odontoblasts, as I shall presently show in a photograph upon the screen; but in other specimens from adult teeth, one can trace fibres to a deeper layer than the odontoblasts, and even beyond any layer of cells such as Professor Klein describes.

I think I have sufficiently shown that the subject of the development of dentine is a very considerable tangle, and that very much of it remains to be unravelled,

but I will now refer to some recent investigations, and also to my own attempt to disentangle a portion of it. In examining a longitudinal section of a bicuspid tooth cut by Weil's process and unstained, I saw projecting into the pulp cavity all round the margin, processes like spiculæ. The pulp, though partially retained, had been torn away in many places from its connection with the dentine. These bundles of fibres—for such they distinctly appeared to be—were evidently continuous with the calcified substance of the dentine on one side and the pulp on the other. The cell layer had fallen away. This specimen seemed so remarkable that I cut and examined many more, and although this was peculiar in the degree of apparent stiffening of the bundles, I found that fibres from the pulp passing into the dentine and incorporated with it were very constantly met with.

It is very difficult to see these fibres in many instances where the odontoblast layer is strongly marked, as they are hidden by the crowded cells, and it requires a very thin section to show a single layer of cells only. These prolongations also are very transparent, and I found more than once that when I have seen them during the preparation of the specimen I had lost them when mounted in balsam, their index of refraction approaching so nearly to that of this substance. In older teeth, where the deposition of dentine is not in active progress, and the odontoblasts are absent, the fibres are very marked, and this was especially well shown in a canine from an old person lately exhibited on the screen by Mr. Hopewell Smith, of which I will also, with his permission, show a photograph this evening.

In stained preparations, where the continuous layer of the odontoblasts is not visible, bundles of fibres are distinctly seen, and in many instances these are crowded with small cells, the nuclei of the odontoblasts being visible in the interspaces between the bundles. This appearance puts

one very strongly in mind of the osteogenic fibres in membrane bone calcification. If young teeth with incompleted roots are examined, the fine connective tissue fibres are seen passing into the uncalcified portion of the matrix, which is in such teeth proportionally very broad, and the odontoblast cells are seen at the same time forming a very distinct layer, and with separations between them.

Another point shown by these specimens which I shall dwell upon presently, is, that a fine striation is visible in the more recently calcified dentine.

Turning my attention to the dentine of other mammalia, I found in the pulp of the elephant's tusk a very strongly marked connective tissue incorporated with the dentine; and in the incisor tooth of the rat, this passage of the connective tissue of the pulp into the dentine is more marked than in any teeth I have examined.

Not only, as the photographs will show, can one trace the oblique passage of the fibres into the calcified substance, but in the formed dentine a strongly marked striation parallel with these fibres is very distinct.

At the suggestion of Mr. Tomes, I now turned my attention to fish, and chose as a typical vaso-dentine the teeth of the hake (Merlucius). The strongest confirmation of the conclusion that connective tissue bundles are directly concerned in the process of dentine formation, was given by vaso-dentine.

I here found a distinct layer of connective tissue fibres or bundles of fibres surrounding the pulp cavity and apparently continuous with the dentine, this layer having been hitherto described as an odontoblast layer by Mr. Tomes.

In connection especially with the subject of vaso-dentine, I must here acknowledge my great indebtedness to my friend, Mr. Charles Tomes, who has not only most kindly given me advice and direction in this research—but has also in the true scientific spirit, when convinced of the correct-

ness of the new light thrown upon a subject he had made especially his own, helped me by every means in his power to render the point still clearer.

When these fibres are distinctly visible as a layer, it is very difficult to detect any cells in connection with the dentine, but in other specimens, where the layer is not so marked, rounded cells are seen forming a distinct layer in contact with the dentine, and these cells can be traced into the bone of attachment at the base of the tooth, where cells precisely similar in appearance are in contact with the bone.

In many of Mr. Tomes' specimens, the substance of the vaso-dentine is seen to be split up into fine fibres similar in appearance to those surrounding the pulp, and running in the same direction, but, curiously enough, at right angles to the very obvious longitudinal striation of vaso-dentine.

Mr. Tomes has, in recent investigations, also found an outer layer of the dentine apparently made up of decussating fibres.

Reviewing these evidences in the light of the remarks I have made above, concerning the development of bone, and allowing, as I think we must, that connective tissue actually enters into the substance of formed dentine, I think some modification of the ordinary views of dentine development is required. While admitting that much of our tangle remains to be unravelled, there is, I imagine, sufficient evidence to lead us to conclude as probable, that dentine, like bone, is formed on a connective tissue foundation.

Other evidence of this is also produced by the pathological decalcification of the dentine that takes place in caries. In a specimen in which caries had penetrated to the pulp (cut by Weil's process, without artificial decalcification), I found distinct connective tissue bundles in the substance of the dentine. Professor v. Ebner has described similar appearances in carious dentine.

The same author also describes a laminar arrangement

of the dentine, and expressed himself convinced of this in a paper on "The Fibrillar Structure of the Dentine and its Similarity to that of Bone" published in 1875. In a later publication (the article entitled, "Histologie der Zähne," in the *Handbuch der Zahnheilkunde*, Vienna, 1890), von Ebner says that dentine decalcified in hydrochloric acid in a 10 or 20 per cent. solution of common salt, exhibits a fibrillar structure, the fibres being doubly refractive, and having all the characters of connective tissue fibres.

Dr. Sternfeld, of Munich, a member of our Society, wrote a paper on the construction of the dentine of the pike, in which he contested the validity of the distinction drawn by Mr. Charles Tomes between vaso-dentine and osteo-dentine. In this paper he speaks of osteo-dentine as consisting of a fibrillar basis, and compares it to the calcified ligaments of birds, which consist chiefly of bundles of Sharpey's fibres with a connecting substance.

In another article, in which he criticises Dr. Weil's process of section cutting—speaking of Dr. Weil's description of connective tissue bundles in the substance of the pulp—Professor von Ebner says that as far as his own observations go, natural well-defined fibrous bundles, such as one finds everywhere in loose connective tissue, do not appear in the pulp. He is under the impression that connective tissue fibres running in all directions, exist in the pulp, but no real connective tissue bundles. I think, therefore, that Professor von Ebner cannot have seen the prolongations which I have described as springing from the dentine.

Some very strong evidences of the laminar nature of the dentine are given by several of my specimens. A tooth partially decalcified in strong formic acid shows lamination very distinctly, and several specimens of carious teeth of my own preparation and from Dr. Miller's collection, show marked signs of lamination. The specimens treated with glycerine

by Mr. F. Bennett, and described by him in the *Odontological Transactions*, vol. xxi., show indications of laminæ.

If my observations and those of Professor v. Ebner are corroborated and accepted, dentine will be brought out of its isolated position, and classed with the connective tissues.

The matrix consisting of an intricate network of connective tissue fibres, we can hardly conceive of the odontoblasts as being directly converted into dentine, their fused protoplasm forming its substance, but would rather hold with Baume that "the odontoblasts" (and other cells of the pulp) "secrete a material which calcifies rather than that they are themselves converted into dentine."

In the next room I have, under the microscope, some of the more important specimens illustrating this subject, many of them being those from which the photographs were taken which will now be shown upon the screen.

I am much indebted to Mr. Theodore Harris for his share in the preparation of these specimens; his help has enabled me to prepare many more than I otherwise could have done, and there is—in such researches especially—safety in numbers.

A series of photographs in illustration of the subject were then shown upon the screen.

Mr. C. S. Tomes said that Mr. Mummery had been so good as to show him his specimens in various stages of preparation, but he felt that Mr. Mummery's acknowledgments of help from him (Mr. Tomes) were really in excess of what he deserved. He had very carefully examined both Mr. Mummery's sections and some old ones of his own, and he was entirely and thoroughly convinced of the truth of the results at which Mr. Mummery had arrived. Mr. Mummery's research had to a great extent upset a comparison which Mr. Tomes had instituted between osteo-

dentine and vaso-dentine. He had described a layer which he now recognised as connective tissue fibres in pulps forming vaso-dentine as odontoblasts, but Mr. Mummery had shown these to be much larger and to be devoid of nuclei, and had further found among them some cell structures much more nearly resembling odontoblasts or osteoblasts. In his own old specimens, Mr. Tomes could see that vaso-dentine was wholly built up of these fibres, which were continuous with connective tissue framework of the pulp. Mr. Mummery's paper opened up a large field of research; the odontoblasts and their processes, the dentinal fibrils, were left out in the cold, and nothing was really known about them—less, probably, than was known about osteoblasts and other similar cell structures. And again, the whole question of the sensibility of dentine was left unanswered, although he believed that Mr. Mummery was still engaged in working upon the subject. Mr. Tomes felt the Society would agree with him that Mr. Mummery had opened out a very wide field for future work, and had dwelt far too slightly upon the very great labour which the research had cost him.

Mr. Sidney Spokes said he did not know whether he was in order in remarking upon a Presidential address, but as a younger member of the Society perhaps he might be permitted to follow the example of an authority like Mr. Tomes. He wished to add his humble meed of praise for Mr. Mummery's work. He had been stimulated to try and follow to some extent in his footsteps, and had now several sections prepared by the Weil process, which showed many of the points to which the President had drawn attention. Perhaps it was scarcely fair, after the President had told them so much, to try and get further information, but those who were interested in these matters would be glad to know if Mr. Mummery had found any sign of lymphoid tissue, any indication of peri-vascular lymphatic spaces in the pulp. Also whether, considering recent observations showed that there was no absolute continuity between sensory nerve fibres and the central cell, the President did not think there might be a somewhat analogous condition

at the periphery in the pulp, rendering it unnecessary to believe that the ultimate nerve fibril was in actual continuity with the dentinal fibril, but only brought into relationship with it. He apologised for obtruding these remarks, but was quite sure they all felt indebted for the excellent work Mr. Mummery had done.

Mr. MUMMERY, in reply to Mr. Spokes, said he had not found any trace of lymphatic tissue in the pulp, but he had not stained or examined the tooth pulp for that purpose. With regard to the possible connection between nerve fibres and dentinal fibrils he must be permitted to reserve his reply, as the investigations on which he was at present engaged dealt with that subject, but they were not yet sufficiently advanced to allow him to give any results. Mr. Tomes had referred to some of his (Mr. Mummery's) conclusions being subversive of former researches of his own, but these only affected a small portion of all the important work Mr. Tomes had done, which would still remain unassailed and conclusive. Finally, he would heartily thank Mr. Tomes for the friendly way in which he had reviewed his work, and the Members of the Society for the kind manner in which his address had been received.

Votes of Thanks.

A vote of thanks was accorded to Mr. Tomes for his communication, and to Mr. Curtis for his skill in the management of the lantern.

The next meeting of the Odontological Society of Great Britain will be held at 40, Leicester Square, W.C., on Monday, March 7th, at 8 p.m. Discussion on Irregularities, associated with Anterior Protrusion of the Upper Teeth. To be opened by Mr. David Hepburn. Casual Communications:—Mr. Newland-Pedley, "Dry specimen of Sequestrum from the buccal surface of the alveolar process, in which a gold filling had been inserted;" Dr. E. W. Roughton, "Notes of a Case of Sarcoma of the hard palate."

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING,

March 7th, 1892.

MR. J. HOWARD MUMMERY, M.R.C.S., L.D.S.,

PRESIDENT, IN THE CHAIR.

THE Minutes of the last meeting having been read and confirmed,

Messrs. E. W. ROUGHTON, M. Y. WOOLF, and PERCY SMITH signed the Obligation Book, and were duly admitted to membership by the President.

The following gentlemen were ballotted for, and elected:—

Resident Members:—Messrs. T. H. G. WRIGHTON, L.D.S.Eng., 7, Bloomsbury Square, W.C.; C. J. BLAABERG, L.D.S.Eng., 2, Argyle Square, King's Cross, W.C.; A. R. COLYER, L.R.C.P., M.R.C.S., L.D.S.Eng., 66, Christchurch Road, Tulse Hill; H. A. FORSYTH, L.D.S.Eng., 24, George Street, Hanover Square, W.; W. S. HOLFORD, L.R.C.P., M.R.C.S., L.D.S.Eng., 23, Wimpole Street, W.; EDMUND BALDING, Jun., L.D.S.Eng., 732, Holloway Road, N.; GEORGE HERN, L.R.C.P., M.R.C.S., L.D.S.Eng., 18, Stratford Place, W.; P. L. WEBSTER, L.R.C.P., M.R.C.S., L.D.S.Eng., 2, Redesdale Terrace, Canfield Gardens, N.W.

Non-Resident Members:—Messrs. F. H. ELLWOOD, L.D.S.Ire., Granville House, Redhill, Surrey; R. E.

Waller, L.D.S.Eng., Cairo, Egypt ; M. F. Hopson, L.D.S. Eng., The Croft, Newbury, Berks.

The Librarian (Mr. Ashley Gibbings) then announced he had received between February and March, 1892, the Calendar of *The Pharmaceutical Society of Great Britain*, 1892 ; a paper by Sir John Tomes, F.R.S., reprinted from the *Quarterly Journal of Microscopical Science*, Vol. iv., on "Certain Conditions of the Dental Tissues, and on the Structure and Development of Enamel;" "Anatomy, Physiology, and Diseases of the Teeth," Thomas Bell, 1826, presented by Mr. C. Robbins. Received between January and February, and not reported to the Society in February : "The Human Teeth," by Hunter, 1771, and "Principles of Dental Surgery," by Leonard Kocker, 1826, presented by Mr. C. Robbins; Lectures on the "Diseases of the Jaws," delivered at the Royal College of Surgeons, 1887, presented by Mr. Christopher Heath ; and *Transactions of the American Dental Association*, 31st Annual Session, August, 1891.

The Curator (Mr. Storer Bennett) announced that three specimens had been added to the Museum. Mr. Quinby (Liverpool) had presented a plaster cast, &c., of an inferior maxilla. Mr. James Hoare had presented two specimens, one an upper model, showing a conical supernumerary tooth which had been extracted, and which accompanied the model. The second was a right upper wisdom tooth, which in extraction brought away the tuberosity of the superior maxilla.

Mr. F. Newland-Pedley showed a dry specimen of sequestrum from the buccal surface of the alveolar process in which a gold filling had been inserted.

Since the last meeting of the Society, Mr. Newland-Pedley had seen a patient, who complained of a little hole in her gum from which there was an offensive discharge. She said there had been a gumboil over the root of an upper back tooth, which had led to the existing condition. The patient consulted her dentist about the disagreeable discharge, and about fifteen months ago he inserted a gold

filling in the little hole in the gum. On examination of the mouth Mr. Newland-Pedley found the gold filling inserted in necrosed bone, and with the aid of a little cocaine removed the small sequestrum with the filling *in situ*. The specimen and model of the mouth are shown. The dentist was said to have a large practice in one of the favourite suburbs of London.

Mr. W. A. Maggs wished to know how long the filling remained there, it was apparently not that which caused the necrosis.

Mr. Newland-Pedley replied that the filling was done fifteen months ago, and in a spirit of charity, which it was hard to extend, he tried to believe that the bone was necrosed.

Mr. R. H. Woodhouse asked if Mr. Newland-Pedley happened to know whether the adjoining teeth were dead?

Mr. Newland-Pedley stated that the teeth on neither side were dead, he had seen the patient only that day, and found that the dentist had drilled in between the roots.

Mr. E. W. Roughton read "Notes of a Case of Sarcoma of the Hard Palate," and said:—

J. Tomlin, a labourer, 74 years old, was admitted under his care at the Royal Free Hospital, on April 27th, 1891. Early in February, 1891, he noticed a small, hard, painless lump in the roof of the mouth. He showed it to a chemist, who gave him some medicine to cure it. On April 23rd, he was seen by Mr. W. T. Fisk, L.D.S., who at once recognised the nature of the disease, and transferred him to Mr. Roughton's care.

When admitted to the hospital, the lump in the mouth was about the size of a hen's egg. It was growing apparently from the periosteum of the hard palate, on the left side, transgressing the middle line, and encroaching upon the palate process of the right superior maxilla. It was smooth and hard, but decidedly elastic to the touch. The soft palate was unaffected, and there was no evidence that

the antrum was involved. The upper jaw was completely edentulous. There was no enlargement of lymphatic glands, and the general health was very good.

On April 29th the patient was anæthestized, and Mr. Roughton made an incision over the tumour, and shelled it out. The finger inserted into the cavity thus made, discovered that the palate had been perforated by the disease, and the antrum thereby involved. The upper lip was reflected and a saw inserted into the left side of the nose, the superior maxilla sawn through horizontally, just above the level of the palate process. Having removed the left half of the hard palate, Mr. Roughton chipped away enough of the right palate process to completely remove the disease. The patient bore the operation very well, and within a week was well enough to get up. However, twelve days after the operation, without discoverable cause, his temperature suddenly ran up to 103°, and he became delirious. On the next day the temperature reached 105° and he died without developing any further symptoms to elucidate the cause of the fever. The *post-mortem* examination did not help to determine the cause of death. The brain was healthy, the lungs, although somewhat congested at the bases, were crepitant throughout, and free from any inflammation or purulent condition, with the exception of the bladder, which was hypertrophied as the result of an enlarged prostate, the other organs were natural. At the time the patient was in the hospital, influenza was very prevalent. For want of a better explanation it was concluded that he caught the disease, and being an old man and depressed by a severe operation, he succumbed to it.

The microscopic examination of the tumour showed that it was a sarcoma composed of small round cells, with a few myeloid cells scattered here and there.

His chief reason for bringing this case before the Odontological Society was, that he felt very strongly that the subject of malignant disease of the mouth could not be introduced to the notice of the dental surgeon too often or too forcibly. The early stages of cancer of the mouth often cause so little trouble and inconvenience, that

the patients put off seeking advice until the disease has extended beyond the range of operative treatment. He imagined that dental surgeons whilst operating on the teeth must frequently see disease for which they are not consulted. In such cases their responsibility was very great, for, unless they warn their patients that prompt treatment was necessary they are allowing the disease to advance to a stage when surgery can do nothing, and the only result can be a painful death.

Mr. Sidney Spokes, commenting on Mr. Roughton's remarks as to the importance of the dental surgeon recognising conditions of the mouth which would not properly come under his treatment, said, a short time ago he saw a man who came to him for the extraction of a lower molar; he presented certain symptoms, and Mr. Spokes discovered a large lump on the left side of the tongue. On further examination, it turned out to be a very bad case of epithelioma which had got beyond the stage of treatment, and the surgeon refused to operate. Here was a case in which the patient discovered nothing for himself, and circumstances only came to light when the disease had gone too far to be dealt with.

The President said that Mr. Roughton's case was a very interesting one; if there were no further remarks he would call upon Mr. Robbins for a casual communication.

Mr. Cornelius Robbins said that it was so small a matter that he had to bring to their notice that he almost felt he ought to make an apology for doing so, but their daily practice was made up of small things. For a long time he had been dissatisfied with the large Gutta Percha heater of Flagg's, he had, therefore, contrived a simple arrangement which could be fixed to the shield of a spirit lamp: the Dental Manufacturing Company had made the one which he exhibited, and being simple and small he did not think it would cost much; he should mention that it was not advisable to fill it quite full of water, and the easiest way to fill the reservoir was with a syringe.

The PRESIDENT thought the contrivance very compact and useful.

Mr. GEORGE BRUNTON, of Leeds, showed a small apparatus which he had used for about six months for keeping pellets of Japanese Paper hot; it consisted of a small oven jacketed with water, and kept hot by a spirit lamp, he found in practice that only one ounce of water evaporated in eight hours. There were two compartments, the top for heating gutta percha, and the other for "Flagg's High Heat," he also found it useful as a vaporizer.

The PRESIDENT said that as they had no promise of a regular paper, it was proposed to have a discussion on irregularities, associated with anterior protrusion of the upper teeth. Several gentlemen had offered to speak, and Mr. David Hepburn had kindly undertaken to open the subject. As the subject was a very wide one, it was intended to strictly confine the discussion to those associated with the anterior protrusion of the upper teeth.

Discussion

ON ANTERIOR PROTRUSION.

In introducing the discussion, Mr. David Hepburn said :—

Mr. President and Gentlemen,—When our worthy secretary, Mr. Maggs, called upon me a short time ago and explained that it was the desire of the President that at this meeting of our Society a discussion should take place in connection with irregularities of the teeth, I concurred fully in the desirability of such a proceeding, feeling assured that the accumulated experiences of members necessarily called forth by a discussion on a theme of such importance would be a means of adding materially to our knowledge. The subject, however, seemed a large one, too extensive for the limits of one short meeting, and I was gratified when I learned that the intention was to limit the discussion to one distinctive form of irregularity, namely, that of "Anterior Protrusion," and in connection only with the upper jaw. The special type of deformity selected seemed to me to be wisely determined upon, for no condition of abnormally placed teeth presents more points of interest, it being obscure as to its etiology, markedly disfiguring to the patient, in pronounced cases eminently difficult to remedy, and frequently uncertain as to the ultimate results of treatment.

When our President did me the honour of inviting me to open this discussion, I willingly assented, especially as I was assured that a few remarks would suffice for the purpose. It is not, therefore, my intention to dogmatize or endeavour to unfold to you the whole subject, but merely to place before you a few points gained from my own experience and observation, which may be useful in a measure by serving as keys for unlocking the gates of that knowledge which I feel sure exists in this Society.

From my collection I have selected a limited number of models which I shall presently describe to you. In one of

the cases the patient has been under observation for seven years, and in another I have had frequent opportunities of noting the various changes in the mouth during a period of twelve years. The selection of these two cases has been made with a view to the practical illustration of two points which I consider of great importance, namely, the occasional uncertainty of treatment, and again the marked tendency which nature has, in certain cases, to modify abnormal conditions of protrusion, which in the child are evidenced in unsightly disfigurement, until in the adult an almost normal state results, or more strictly speaking, one which is little offensive to the eye.

Now, in speaking of anterior protrusion in connection with the upper jaw, I wish to direct my remarks as far as possible to those cases where the deformity exists as a distinctive condition due to abnormal deposit of bone in the pre-maxillary region, its origin being unattributable to mechanical influences such as thumb-sucking or the impingement of antagonizing teeth. Doubtless, both these agencies may materially assist in exaggerating protrusion where the tendency exists for its development, but, unquestionably, there is a distinct class of case which has its origin in some inherent propensity in the individual to excessive development of osseous tissue, cases in which the lower incisors never have, and never can, come in contact with the posterior surfaces of their natural opponents in the upper jaw, and where even indirect force, applied through the mucous membrane and alveolus cannot be credited with aiding towards the deformity, because the cutting edges of the lower incisors exist as it were in space, pointing upwards towards the palatal vault, and free from contact with any of the super-existing structures. The appearances characteristic of the deformity are too well known to need mention; indeed, I fear the child with the obtrusive incisors overlapping its lower lip is now-a-days a too common object in the consulting room of the dental practitioner.

As to the etiology of this condition I think we have yet much to learn. The difficulty of obtaining even dry specimens is so great that the possibilities of research in this

direction are limited, but the question of heredity is one which may with advantage be discussed.

It is, I believe, sometimes stated that the condition is *not* due to the influence of parental transmission, but in my own experience I have found it frequently attributable to this cause; indeed, in most of those cases, the models of which I happen to have brought with me this evening, I have been able in the parents to recognize conditions which would be likely to descend in the form of superior protrusion in the offspring.

Curiously enough, no marked peculiarity distinguishes the temporary dentition, but in my own mind I am apt to associate a somewhat narrow and abnormally deep temporary alveolus with the probability of "protrusion" when the permanent teeth are erupted. It would appear that excessive proliferation of bone cells at about the period of the eruption of the anterior permanent teeth in the upper jaw at first imparts to them an oblique direction which becomes more marked as eruption progresses. This once established, continued and excessive growth of the alveolus takes place, which may go on to greater or less degree. The teeth are carried with it, sometimes only to the extent that the lower incisors impinge at the necks of the superior teeth, but again so great may be the abnormal growth that frequently the superior incisors, with their concomitant alveolus, protrude offensively an inch or so in advance of the normal arch. In any case a more or less imbecile expression of countenance is imparted by the deformity, although the child may be mentally and physically well developed in all other respects.

The teeth may frequently have more than sufficient room, and apart from their undue prominence may be erupted in a regular arch. On the other hand, they are frequently crowded and irregular, but I look upon this as, so to speak, an accidental condition due, may be, to extreme size of the organs or irregularities in the position of their crypts previous to eruption. This condition of "irregularity" complicates treatment in a marked degree.

I have spoken of this distinctive protrusion as being associated with the intermaxillary region, and I believe it

to be so, for in a large number of typical cases the canines are erupted in normal antagonism with their opponents. When such is not the case their forward position, as far as I have been able to observe, is due to this accidental irregularity, sometimes associated with the excessive bone development I have just referred to.

Now, under certain conditions, namely, where there is no inimical impingement of the lower incisors or loss of teeth from decay, or other causes, in the masticating region, I believe there is a marked tendency on the part of nature to modify this deformity as time goes on. With the complete eruption of the incisors, provided there be no undue pressure from the advancing bicuspids and molars, I incline strongly to the opinion that the deformity has reached its greatest development, and that if the teeth have but room they will improve in position rather than grow worse. The natural increase in length of the bicuspids and molars is a most important means of bringing about conditions favourable for improvement, so also the muscular action of the upper lip, especially if attention be directed to it. But in addition to all this the facial bones and superjacent muscles and integuments increase to dwarf, as it were, the deformity, and to such an extent, that with the other agencies alluded to at work, frequently an unsightly child may, without mechanical or surgical interference, develop into a presentable adult.

These conditions, showing that after a certain period natural agencies are with us, indicate clearly the beneficial results which may be expected from judicious treatment such as the raising or alteration of the bite, the removal of harmful antagonism of teeth, the extraction of teeth to create space, and when favourable conditions are established the application, by mechanical means, of pressure to the prominent organs. Further, the recognition of the physiological changes which the alveolus may undergo, and the probable alterations which time may effect in the relations of the teeth to one another must serve to aid us in deciding when it is advisable merely to wait and watch.

Lastly, the density of the osseous tissues, the position of the apices of the roots of the offending teeth, and firmly

established conditions of inheritance, conditions which in the parents have not yielded either to natural forces or surgical or mechanical interference, will assist us in forming a prognosis as to what extent treatment, if adopted, may be successful in its ultimate results.

And now, Mr. President and gentlemen, in order to bring my remarks to a practical issue, I will with your permission describe the models I have brought with me.

No. 1.—Shows models of the mouths of two sisters, aged 11 and 12 years respectively, both illustrate inherited anterior protrusion.

Model A shows in addition irregularity of the front teeth and torsion of bicuspids.

Model B shows some of the characteristics of the V shaped maxilla associated with anterior protrusion.

No. 2.—Shows anterior protrusion without irregularity or crowding of front teeth, but associated with eversion of superior and inversion of inferior second molars on both sides. Female, æt. 14.

No. 3.—*Model A* shows inherited anterior protrusion associated with density of osseous tissues and loss of teeth in masticating region. Female, æt. 18.

Model B.—Anterior protrusion associated with extensive loss of bicuspids and molars. Female, æt. 38. In this case a gold plate carrying artificial teeth has been worn for some years, but the jaws have gradually approximated as shewn by the bite. Patient states that with the disappearance of the back teeth protrusion has become more and more marked.

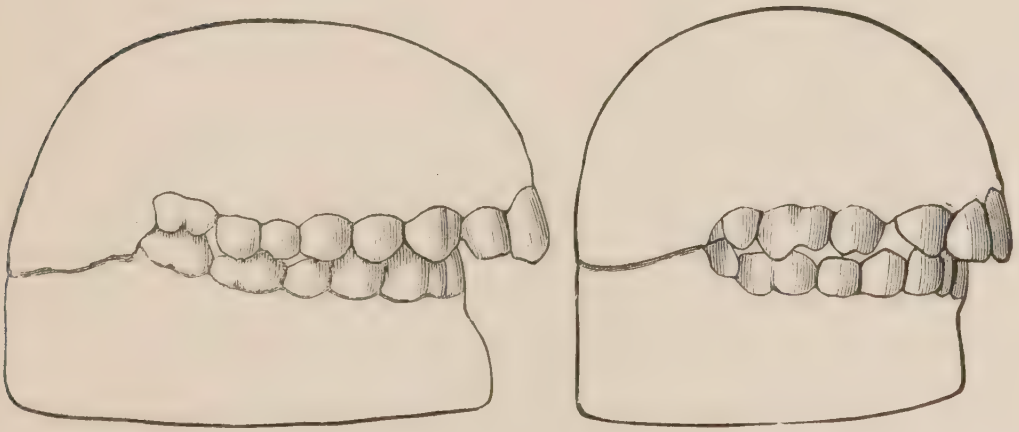
No. 4.—Shows anterior protrusion successfully treated by extraction of first bicuspids and mechanical pressure. Female, æt. 14.

Model A.—Taken in 1888.

Model B.—Taken in 1889.

C.—Apparatus used.

No. 4.



Mod. A. Mod. B.

No. 5.—Illustrates uncertainty of treatment in a case of marked anterior protrusion inherited from both parents and associated with

density of the osseous tissues, irregularity of the teeth and disproportionate size. Female, small featured.

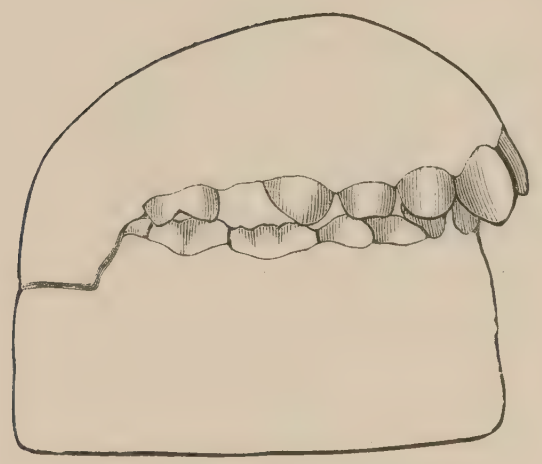
Models A, B, C, D & E, show various changes in the mouth, brought about by mechanical pressure, nearly all the teeth having to be acted upon in consequence of their undue size and irregularity on eruption, during a period of seven years; treatment, of course, being discontinued at intervals, but patient being always under observation.

No. 6.—Simple and common variety of inherited anterior protrusion. Female, æt. 13. Sole treatment, extraction of second bicuspids. To illustrate case where by creating room and relying upon the natural elevation of the bite improvement will take place.

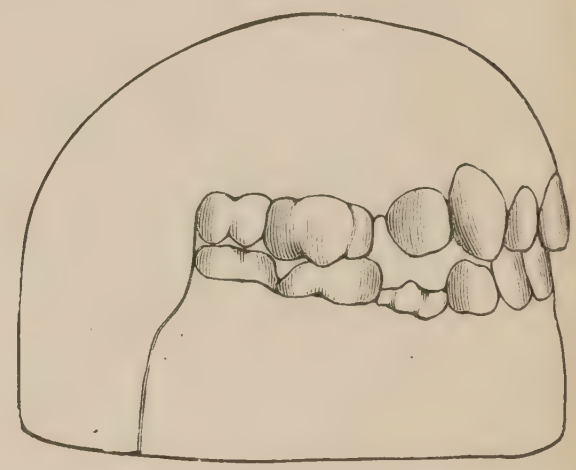
No. 7.—*Models A & B.*—Two models taken at an interval of 12 years. Male, protrusion inherited. Illustrate great modification of abnormal conditions by purely natural agencies. No treatment whatever having been adopted. Peculiarly interesting by the presence of two retained temporary molars which show clearly the extent to which the permanent molars and bicuspids have elongated with time.

Torsion of bicuspids is also shown.

No. 7.



Mod. A.



Mod. B.

The President invited Mr. Woodhouse to continue the discussion. Mr. Woodhouse said that he rather wished first to hear what others had to say on the matter, they each had their own views and he did not wish to obtrude his without hearing what plans others adopted. The introduction which they had just heard was an exceedingly good and learned one, but he should have been glad to hear of the means which Mr. Hepburn adopted when he used mechanical force; in his (Mr. Woodhouse's) own time he had used various forms of force, and had now come to use

almost exclusively elastic gold springs: these were first introduced to him by the father of their President. As to leaving matters to Nature, he entirely agreed with Mr. HEPBURN that nature did very much of herself, but he thought that they should aid her. He had here a model (shown) of a case in connection with which there was no history of hereditary protrusion; it had at first appeared hopeless. They might perhaps see the protrusion of the teeth entirely disfigured the mouth, and the lower incisors impinged on to the gums about $\frac{1}{16}$ of an inch inside the tuberosity of the upper incisors. His plan was to cap the six-year-old molars and bicuspids, and allow the twelve-year-old to grow, he then removed the first bicuspid—the second was often the best—and also removed the first bicuspid in the lower jaw; he put vulcanite plates with the gold springs, of which he had spoken, to bring back the teeth in both jaws. He would mention that in his opinion it was extremely important not to attempt to bring back more than one or two teeth at a time, otherwise one would bring the back teeth forward. This case was treated in 1882, and the patient had now a very presentable appearance; the lower teeth do not impinge on the gum at all, and the upper incisors have been brought in $\frac{3}{8}$ of an inch—which makes a great difference in the mouth. He should state that it was most important to begin at the right age, he never began until the twelve-year-old molars had erupted, one was often importuned by anxious mothers to begin too soon, but he never did so. While on this subject he wished to bring before them a plan which he had adopted for some time, and which he had found most useful. Of course they all knew that when the first molar is taken out the twelve-year-old molar is extremely prone to come forward. It occurred to him some years ago to make a plate, such as represented on the model, to prevent its doing so (shown). The impression was taken from the mouth when the plate was *in situ*. The plate rested against the neck of the upper incisors and fitted the front and both sides of the second molar. He would here remark that in making a case of this kind he carefully trimmed up the model himself. It required to be done very nicely, so that the vulcanite clasp catches the

inside of the neck of the tooth, and the flattened pin wire goes round and grips the tooth on the outside. As one treats the upper jaw so the lower jaw should be treated as regards the removal of corresponding teeth, but as the lower bicuspids have a much greater tendency to retreat than the upper, a retaining plate is not necessary for the lower twelve-year-old molars. The first cases that Mr. Woodhouse had of this kind were of two young ladies going abroad. It occurred to him to treat them in this way, and he did so. The mouths were very crowded, and he put a plate into each mouth. He did not see them for a year and a half, and, to his great delight, at the expiration of that time the mouths had assumed a normal condition, all the teeth being in their proper position. He would trespass no longer upon the time of the Society.

The PRESIDENT remarked that this plan of Mr. Woodhouse's seemed most admirable, and would get over a great many difficulties; he would now call upon Mr. Walter Coffin.

Mr. WALTER COFFIN felt the impossibility of adding to Mr. Hepburn's remarks as to the etiology of the conditions met with in the protrusion of the superior teeth, but was sure that the stress laid upon the artificial causes by Dr. Chandler and Mr. Quinby was not now much considered. He (Mr. Coffin) would like to say how strongly he felt with Mr. Hepburn as to the tendency of many cases to improve in the course of time, and he had hoped that some agreement more or less might be come to among the members of the profession on this point, in order that when one was pressed by parents to commence work too early one might feel that one had the support of professional brethren in resisting importunities. Mr. Woodhouse had shown them how the mechanical appliances must be governed by very careful consideration, in order that they might do good instead of harm. Of course it was not necessary to say that plates capping all the posterior teeth did more harm than good. Possibly many mechanical contrivances might not accomplish more than a waiting policy would do, but at the same time, in waiting for things to improve much, one

was often disappointed. He had a case of his own in his mind, of a girl aged 19. The deformity had not improved to any appreciable extent, and when he was called upon to treat the case, had felt justified in doing so. The case was complicated by the fact that the lower teeth impinged on the lingual margins of the gums, and one had to open the bite artificially, and in a careful way, to ensure a permanent opening in the manner which Mr. Woodhouse had pointed out. In this case the teeth were brought back. There was no difficulty in doing this, but it was the permanency of these results which was a matter of doubt. In this case the patient wore a plate for seven or eight years. She who was a girl was now a woman of thirty. There had been no tendency for the front teeth to resume their former position. He attributed this to the same causes which produce spontaneous improvement. Wearing a plate long enough seemed to ensure a successful result. He thought something more might be said of the discrimination and classification of cases. They saw cases of slight spaces between the front teeth; in others there were no spaces. Then they saw cases where the lower teeth impinged, and where they did not, and these cases must be considered each in the light of their special circumstances. He did not think that much could be added to what had been said, except that he thought that some middle ground might be found between those who thought it was very rarely possible to assist nature and those who thought it was well to commence when the twelve-year-old molars had erupted. As to mechanical contrivances he felt sure that most practitioners had arrived at the conclusion that elastic ligature, india-rubber bands, and such more or less unstable appliances, did more harm than good, and that unless the contrivance could be a plate which could be self-contained, rigid, and not easily put out of order, it would be better not to do anything at all. Many must have been disheartened, and disinclined from experience to fall back upon easy contrivances. These cases were undoubtedly those which gave the greatest anxiety and embarrassment, both in advising patients and making up their own minds in following a

course of treatment. In deciding between the two schools it was certainly very difficult to say to the young practitioner who had used his plates that equally good results would have come about without the plates. It was impossible to say how much had been due to the plate and how much to the working of nature. If they studied the construction of plates very carefully, they would see that suitable plates, if not actually assisting nature, would not hinder her. They must all have seen plates which they were obliged to condemn, and he thought that concentration on this point of regulation was a very great advance in the discussion as to the desirability of attempting any mechanical amelioration of conditions.

Mr. George Brunton exhibited a model showing the protrusion of the teeth before treatment. The six-year-old molars being decayed were removed and expanding plate was inserted, and after the jaw was sufficiently expanded all the upper nine teeth were drawn back simultaneously by one apparatus; he had not the apparatus with him, he had made a search for it but was unable to find it, the upper left canine was missing altogether, but one thing he should like to get a little information about, and he had no doubt that many of those present could tell him how the thing could be done or help him in some way: they often noticed that if they had regulated a case, the tendency of the twelve-year-old molars to tip inwardly towards the tongue, and the result was that one got a bad articulation, of course that was due to their coming forward, but if any gentleman could suggest either a remedy or suggest at what age the six-year-old molars should be taken out he should be glad to hear it. One thing struck him in the case Mr. Woodhouse was good enough to show, and that was how did the upper teeth thus travel back without the bite being "jumped" as it is called, because one would think that the articulation of the lower teeth would prevent the upper teeth from falling back. While upon the subject he would like to show the labels for regulation of cases which had been prepared for the annual meeting of the British Dental Association (labels shown.)

Mr. Morton Smale asked what kind of apparatus it was which Mr. Brunton used to draw back the nine teeth simultaneously?

Mr. Brunton replied that the arch was expanded first of all by a split plate and afterwards a vulcanite plate was made to fit the upper, extending as far back as the twelve-year-old molars, wires were attached to the plate coming in front of the first and second bicuspids, the same on either side, and a wire from each side to go round in front, these wires were bent in from time to time; that was the only apparatus that was used. (Mr. Brunton sketched the apparatus on the black-board.)

Mr. Woodhouse feared that he had not made himself sufficiently clear when speaking of the fact, that when the first molar was removed in the lower jaw as well as the upper jaw, the lower biscuspids moved backwards much more readily than the upper, and required no treatment from a plate.

In answer to a question from Mr. Lawrence Read,

Mr. Woodhouse said that when he wanted to raise the twelve-year-old molars, he put a plate on the first molars and bicuspids, which kept the mouth open; the twelve-year-old molars then grew down. He differed from Mr. Brunton; his (Mr. Woodhouse's) plan was to get more resistance behind than could be exercised by the springs, thus insuring the front teeth going back rather than the back teeth coming forward.

Mr. Storer Bennett said that associated with the deformity in question it would frequently be noticed that the lower jaw was short and square, the lower incisors in some cases standing very high, thus increasing the already oblique direction of the upper ones. In consequence of the disproportionate smallness of the lower jaw, compared with the upper one, the lower lip dropped between the two sets of teeth, pushing out still further the uppers. In addition to all this, it would generally be noticed that the upper lip was short, so that it was unable to exert a controlling influence on the crowns of the upper incisors. Indeed, when the obliquity had advanced to a certain degree, the

short upper lip was so pushed up as to press on the roots of the teeth instead of their crowns, making matters worse than ever.

In spite of the adverse opinion Mr. Coffin had expressed for all forms of india rubber in the treatment of such cases, he had great faith in the use of a broad band of rubber dam stretched across the fronts of the upper teeth and attached to the buccal surfaces of a plate on either side, the band being sufficiently wide to drop well below the upper incisors. This, while pressing in the upper teeth, dropped behind the lower lip, and so prevented it impeding their inward movement.

The SECRETARY read a letter from Mr. J. C. Storey, of Hull.

"Dunallan House, Regent Terrace, Hull. March 5, 1892.—Dear Sirs,—I much regret that I am prevented attending the meeting of "Odonto" on Monday evening. I have, however, sent two pairs of models which are fairly typical of several cases I have regulated on the same plan. One case (Edith R.) was retracted without extractions in three months—two years ago. She wore a retention plate for twelve months, at nights only, and the case remains perfect, as shown in the second model. The other, Master H. S., had complications, as in both the upper and lower the arch required widening. This is, however, I think, fairly satisfactory. The plan of regulation was in each case a piece of D. A. struck up from casts to accurately fit the front of the teeth. This was attached by means of elastic ligatures to a vulcanite plate, capping the back teeth, with vulcanite flanges above the molars to receive the attachments. Of course the vulcanite plate left the anterior portion of the palate free so as not to form a resistance to the backward pressure.—Yours very truly, J. CHAS. STOREY."

Mr. R. H. WOODHOUSE said that the discussion had turned on bilateral protrusion of front teeth, but there was one form, viz., unilateral protrusion which was very troublesome. It was generally associated with the central and lateral incisors on the right side of the upper jaw, and was

most frequent in adult life. He had had several cases himself, but did not know of any successful way of treating them. He had found in a few cases that a good effect had been produced by lessening the length of the central incisors. That this irregularity should be more frequently seen in the right side of the upper jaw was rather a puzzle. Many cases which he had in his mind at the moment were, he thought without exception, on the right side. It had struck him that possibly this might be produced by the action of the tongue, which he believed followed the movement of the jaw. From careful observation it would be noticed that the jaw moved in one direction when masticating, viz., from left to right, and the tongue participated in this movement. This tended to exaggerate the protrusion of the incisors to which he had been referred. He did not know that there was any successful method of treatment in these cases, but he thought it was worth mentioning.

Mr. W. Hern said, that there was one case of protrusion occurring, not so much in youth, as in young adult or in adult life, in which the patient complains that his or her front teeth are becoming more and more prominent; in these cases the molar teeth commonly occlude normally, and the lower incisors do not impinge on the lingual surfaces of the upper. On examination of the mouth it would be found that this state of things was due to pyorrhœa alveolaris, the disease, as is usual, affecting the sockets more on the lingual and interstitial aspects than on the buccal. It appeared that chronic congestion tended to separate and throw the teeth forward. He would like to say that his experience, small though it was, confirmed what Mr. Hepburn said as to Nature working the cure in certain cases of anterior protrusion—especially those in which the protruding teeth are spaced. A relative of his own had protrusion of the front teeth which had become very much less marked as she grew older. He thought that it might be explained, to some extent, in this way; that when the child got old enough to have any regard for its personal appearance it tried to cover up the deformity by habitually closing the lips, thereby throwing a stress on the upper incisors,

and tending to throw them back. Before sitting down he should mention that Dr. Talbot, an American writer and careful observer, had written largely on the subject of protrusion of the front teeth, and he thought his classification was very good.

Mr. Betts thought that no one had alluded to the method of using a flat wire with a nut and screw at the side. He had come to the conclusion, that in the majority of cases, a piece of flattened wire with a screw and nut, so that the child, with a turn of the screw from day to day, could keep the pressure constant, was a rapid means of regulating. Then again, he thought in these cases, that the reason they were so often unsuccessful was, that the lower incisors impinged on their antagonists. A good plan was to grind them a little with a corundum wheel when the case is completed.

Mr. S. J. Hutchinson said that there was one point which he should like to mention. No one could doubt the advantage of capping the lower bicuspids and first molars, to get the twelve-year-old molars to rise. He should like to mention that not only could the bicuspids and first molars be capped, but also the tips of the lower incisors, so as to prevent them from rising, and this obviated the necessity of grinding them as Mr. Betts suggested.

Mr. Walter Coffin said—if he might be allowed to speak again—in the course of drawing back the incisor teeth it was found very simple to apply an axial force to push them up into their sockets, and it was astonishing how easily the incisors would respond to the force and keep in their position; he had often helped a case materially by pushing up incisors which would have been too long.

Mr. Baldwin, referring to the remarks that had been made against the use of elastic bands, said there was one case in which rubber could be used very advantageously, and that was in anterior protrusion of front teeth. Here a strip of rubber-dam, buttoned on to the sides of a plate and stretching in front of the six upper front teeth, not only pulled the teeth backwards but also pulled them upwards into their sockets if the buttons were placed high enough,

and thus obviated or reduced to a minimum their lengthening from bringing them from an oblique to a vertical position. The rubber, if brought below the tips of the teeth, would curl round them, acquiring a very strong hold upon them, and showing no tendency to slip up towards the gum. It seemed to him the meeting had not received a clear idea of when these cases should be undertaken mechanically and surgically, and when not. He thought no one there would advise treating these cases until the time when all the teeth had been cut except the wisdom teeth. Then if the lower lip were resting behind the upper front teeth, or if the deformity were considerably apparent, the case should be undertaken. If the teeth were not interspaced something on each side must be extracted. He himself felt that the six-year-old molar was the worst tooth to extract unless it were very badly carious—dead, or pulp exposed. Besides the well-known reasons for this, there was the additional one that the six-year-old molar was a much more powerful support to the bite than any other, and therefore prevented the bite from closing abnormally, and in the majority of these cases increasing the deformity by causing the lower front teeth to impinge on the backs of the uppers. He thought the first bicuspids were, as a rule, the best teeth to extract.

Votes of Thanks.

The President having put the usual vote of thanks, announced the next meeting would take place on Monday, April 4th, at 8 p.m. A Paper will be read by Mr. C. S. Tomes, F.R.S., on "Studies on the Growth of the Jaws." Casual Communications:—A Case of Necrosis and Fracture of the Lower Jaw," Mr. S. J. Hutchinson; "A Tooth forced into the Antrum, and tolerated in that position for three years," Mr. M. Y. Woolf; "The Electric Illumination of the Mouth for suspected Antral Disease," Mr. A. W. Barrett.

H. R. Barraud, Photo. *Woodburytype.*

T. CHARTERS WHITE. M.R.C.S., Eng., L.D.S., Eng.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING,

April 4th, 1892.

MR. DAVID HEPBURN, L.D.S.

VICE-PRESIDENT, IN THE CHAIR.

THE CHAIRMAN expressed his regret that their President was unable to take the Chair as usual, owing to a recurrence of influenza, which he hoped was not very serious.

The Minutes of the previous meeting having been read and confirmed,

Messrs. WILLIAM PALETHORPE, 83, Edmund Street, Birmingham; FRED. H. ELLWOOD, Granville House, Redhill; EDWARD THOS. COOKSEY, 26, Marine Parade, Worthing, having signed Obligation Forms, were duly declared Members.

The following gentlemen signed the Obligation Book, and were formally admitted as Members:—Mr. PERCY L. WEBSTER, Mr. HARRY G. FORSYTH, Mr. WALTER S. HOLFORD, Mr. MONTAGU F. HOPSON, Mr. GEORGE HERN.

The LIBRARIAN (Mr. ASHLEY GIBBINGS) announced the receipt of the following books to the library: "On the Modification of Organisms," by David Syme; *Proceedings of the Royal Institution and Proceedings of the Royal Society*,

Transactions of the Grant College Medical Society, February to December, 1891.

Mr. West presented several curious specimens of old dental instruments to the Society's collection, consisting of a pair of universal molar forceps and three elevators. He said the appearance of these instruments was so remarkable that they made one think there must have been "giants in those days."

Mr. S. J. Hutchinson being called upon for a Casual Communication, said that he had met with a very interesting case in University College Hospital, the circumstances connected with it being of rather an unusual nature. It was a case of necrosis and fracture of the lower jaw, but he was unable to give a very definite explanation of the accident. The medical notes of the case also were not very complete, so that he would be unable to give them the full details of the case in the manner he should like to have done. One evening in February he was asked to see a patient in the wards of the Hospital; he found him in a comatose condition, with his face and jaw done up in a bandage; there was considerable swelling on the left side of the lower jaw, and digital examination showed that very distinct crepitus existed. He decided to leave the case in the hands of the medical staff until he should be called in again. A few days later the patient died. He (Mr. Hutchinson) then endeavoured to obtain some history of the case, and some notes were given him from which it appeared that Mr. P. was a new patient of the dentist to whom he first applied, so he did not know much about him. He first came about ten days before the eventful visit, when he complained of pain in the region of the wisdom tooth. The face was much swollen, and on looking into the mouth, it was found there was a partially impacted wisdom tooth, with one cusp peeping through the gum, the second lower molar loosened, and it was decided that there was an abscess caused by the irritation from the pressure of the wisdom tooth. He had only had pain for about a fortnight; he could hardly open his mouth, so that it was impossible to

get to the wisdom tooth to remove it. It was decided to extract the second molar; poppy head fomentations were ordered and the patient told to come back if he did not get relief. He came back on the 9th, when the wisdom tooth was removed. He again came on the 10th into the dentist's room and tried to speak, but almost directly fell down in a fit; a doctor was sent for, who came immediately. The first stage of the fit was very long and the spasms very severe, he partially recovered consciousness after this fit, but went into a second when they tried to give him bromide; he had four fits in succession, the fourth being by far the worst as they had to resort to artificial respiration; calomel was placed on the tongue and on the arrival of another doctor he injected bromide per rectum. He was in the dentist's room from about 4.15 p.m. till about 8.30 p.m., and never recovered consciousness. He was then removed to the hospital.

Clinical Notes.—"On admission into University College Hospital the patient kept his mouth constantly opened, there was considerable swelling over the angle of the jaw, which was fairly soft. On pushing up the jaw there was considerable crepitus and the movement was very jerky. Distinct movement could be obtained between the body and ramus of the left side of the jaw. On putting the finger into the mouth in the situation of the last molar tooth a hole could be felt with some loose bone in it, the ramus was partly bare along its outer border, and there was a good deal of thickening about this spot; on the outer and inner side the fracture appeared to be transverse. When the patient opened his mouth he seemed to dislocate the right condyle and to be unable to close his mouth himself.

"The post-mortem examination showed:—On dissecting out the lower jaw the bone came out easily with the abscess cavity, greenish in colour, one-eighth inch thick on the left side, holding it together. When the wall of the abscess was cut through, much foul pus escaped, the fracture was then seen extending from the last molar tooth to the angle of the jaw. The bone on either side for nearly half-an-inch was white and stripped of its periosteum, and two small fragments

were seen, one part of the outer wall of the alveolus black in colour, the other part below it. The kidneys were soft and enlarged, cysted on the surface, the capsule being adherent. There was softening of the lower part of the spinal cord. Heart normal. Lungs congested. Brain, excess of fluid in ventricles on the surface.

"Subsequent enquiry elicited that the patient had been treated for tabes dorsalis for three years. His chief symptoms being loss of knee jerk and gastric crises; for this he had been given hypodermic injections of morphia, and on his own account had taken chloral up to 90 gr. per diem. He also had some epileptic fits three years ago, but his urine had never been examined.

"About five years ago he contracted syphilis which affected his tongue, and this became fixed to the floor of his mouth, his speech becoming very thick. Two weeks before admission he went to a dental surgeon, having an alveolar abscess; and his present illness commenced at the dental surgeon's house on February 10th. On admission to University College Hospital, patient had fits every few minutes, his eyes rolled upwards, he had chronic movements of both his arms and general struggling, during the first part of his fit conjunctival reflex was lost. The tonic stage was not marked, he neither bit his tongue nor passed urine or fæces, he was comatose. His urine contained a fair amount of albumen. His face was puffy, no œdema elsewhere. While he lived, his condition did not alter much except that the fits became less frequent, and just before death his temperature rose to 104° F."

The Chairman remarked that it seemed to him to be a case of very peculiar interest, and he thought it very advisable that when possible these cases should be fully reported in their *Transactions*. The apparent injury by the dentist when some troublesome circumstances follow an extraction was a question of very great importance. Allowance was rarely made for the condition of the patient, and they knew that when patients presented themselves suffering with necrosis or other disease of the jaw, possibly some of the jaw would be brought away with the extracted tooth,

when it was not the fault of the dentist. It was therefore important that such cases should be recorded as fully as possible. With regard to the possibilities of the fracture having occurred during the spasmodic contraction of the muscles, if they had the specimen they could then see the line of fracture and the portion of bone burrowed into by the abscess, but without the specimen they could come to no conclusion. From Mr. Hutchinson's description it seemed to him that the spasms were almost like tetanic spasms.

Mr. C. S. Tomes wished to ask what was the cause of death?

Mr. Ionides, House Physician at University College Hospital, being present later in the evening, stated that when the patient came to the hospital they had no history and the fits were those of typical epilepsy. An examination of the urine indicated albuminuria, and the man was suffering from Bright's disease. He had been under treatment for locomotor ataxy, and had also had very bad syphilis, for which he had been treated with iodide of potassium without result. The immediate cause of death was uræmia.

Mr. W. Y. Woolf then narrated the following case. He said in Nov., 1888, A. V. H. (9th Lancers, Ireland) received a blow in the mouth from the kick of a horse, which cut deeply into the substance of the left cheek. The wound extended from a point just above and in front of the angle of the jaw in an oblique direction downwards and forwards, approaching the median line, where it curved upwards, severing the lower lip about a quarter of an inch to the left side, and was continued upwards, severing also the upper lip, and terminated at the situation of the anterior nasal spine. The nose, as well as being bent flat over to the left side, as far as the cartilaginous portion was concerned, might have had the bridge broken, as a slight thickening existed at that point, which the patient declared was not there previously. Two or three teeth were knocked out at the time. Almost immediately after the accident, the staff surgeon

stitched up the wound and advised rinsing the mouth with Condy's Fluid. In spite of treatment there was at times considerable oozing of pus, either directly into the mouth or the pharynx. This state of things continued until he obtained leave of absence and came to London for further advice. The patient had some time previously consulted a dentist in the north of England, who suggested his waiting until the suppuration had ceased, and then having a plate made to fill up the gap caused by the loss of the four teeth. When he presented himself at the National Dental Hospital on Sept. 11th, 1891 (three years after the accident), Mr. Woolf examined his mouth and found the left upper lateral and canine and both bicuspids were missing. The lower canine on the same side was fractured obliquely at the expense of the distal half of the crown, and the first and second bicuspids were represented only by their roots, firmly embedded in their sockets, and almost covered by the gum. Owing to the contraction of the soft tissues subsequent to the accident, the tension of the muscles on the left side was so great that it required considerable pressure to enable one to pass a mouth mirror along the sulcus, especially in the upper jaw. This condition also interfered with the taking of an impression, inasmuch as it had to be done with the mouth partly closed. A closer examination revealed an opening leading directly into the antrum which was almost large enough to admit the tip of the little finger, and situated high up in the sulcus in a position corresponding to the root of the second bicuspid. The left central was extremely loose, and appeared to be merely supported by soft tissue, which presented the appearances commonly seen in cases of necrosis. It would be interesting to learn whether it was the opinion of the Society that this central, which was shown, was covered with tartar, or with adherent necrosed alveolar process. The right upper central was loose, but although dead like its neighbour, was more firmly attached. All the teeth, but particularly those on the left side of the mouth, were thickly covered with tartar. Mr. Woolf came to the conclusion that the patient presented all the symptoms of a foreign body in the antrum, namely,

the presence of discharge in that neighbourhood ; the fact of pus occasionally trickling into the pharynx when in a recumbent position ; the occasional draining of pus into the mouth ; the presence of a fair-sized opening into the antrum ; which latter, no doubt, accounted for the absence of any visible swelling ; and lastly, the fact that the patient never knew how many teeth were knocked out. Mr. Woolf explored the antral cavity with a silver probe, and found, lying in a horizontal position, a hard substance, which he attempted to move ; at first this appeared very difficult, but after a little perseverance he was able to move the end farthest from the nasal cavity slightly upwards, and then the substance seemed to fall into a favourable position near to the orifice opening into the sulcus. In fact all further difficulty was at an end, as by means of an ordinary pair of root forceps he easily removed it. The substance proved to be, as far as he could tell, the second bicuspid, and had attached to it at one point a piece of tissue, which was highly vascular at the time of removal, despite the fact that the tooth was entirely denuded of its root membrane—except at this point. An examination of this tissue under the microscope (for which he was indebted to Dr. Maughan) revealed a purely gum structure. Dr. Maughan expressed a decided opinion that it derived its vascular supply from the neighbourhood of the antrum and the mucous membrane of the nose, while it lay in that abnormal position. Mr. Woolf said he would be glad to know first how such a transplantation was brought about between the two tissues, and secondly, why in the face of a continual bathing in pus, which had the power of stripping off the periosteum from the surface of the tooth, the portion was enabled to survive. Having removed the tooth from the antrum, the cavity was well syringed, part of the fluid escaping into the nasal cavity and the remainder into the oral. A well-marked feature in connection with this case was the fact that the patient had never been able to breathe through the left nostril since the time of the accident ; whereas immediately after the removal of the tooth he was conscious of having regained

that power. A few notes relative to this part of the case, kindly supplied by Mr. E. W. Roughton, who made a thorough examination of the patient at the Royal Free Hospital, were given as follows:—"On looking into the left anterior naris a fibrous band is seen stretching across from the outer wall of the inferior meatus to the inner part of the floor of the nose. This band had probably been formed from granulations, the result of irritation caused by the tooth impacted in the inner wall of the antrum. On the right side there is a spur on the septum nasi and some hypertrophic catarrh, conditions which of course have no connection with the affection of the maxillary antrum." Further treatment consisted in removing the tartar and syringing out the antrum daily with permanganate of potash for three weeks, at the end of which time the parts had regained their normal condition, although the orifice remained patent. Models were taken and a plate made to assist in building up the contour of the face. Although the orifice is not covered by the wing of the plate, yet the food is unable to pass up owing to the extreme tension of the muscles upon that side.

The Chairman said they were much indebted to Mr. Woolf for bringing forward his most interesting case.

Mr. W. A. Maggs thought Mr. Woolf's case very interesting from one or two points of view, one was that the tooth had remained so long unrecognised, and another, that it was tolerated for so long a time. There was no doubt that this very vascular tissue derived its supply from the antrum. He took it that the tooth was tolerated for so long a time because there was a free opening into the mouth; he thought that the substance surrounding the central and lateral was tartar, but the doubt could be cleared up by putting it into some acid.

Mr. F. J. Van der Pant wished to ask how long a time elapsed from the date of the accident to the time Mr. Woolf saw the patient.

Mr. Woolf expressed his regret that Dr. Maughan had

been prevented from being present to support him, because it seemed from a pathological point of view peculiar that this tissue should be gum tissue; he was rather inclined to agree with Mr. Maggs as to the tartar, as there was so much about the teeth generally. The periosteum was stripped off to a great extent and the tartar seemed to steady the teeth in position, consequently the patient had the idea that they were getting firm in the mouth. In reply to Mr. Van der Pant, three years elapsed between the accident and the treatment.

Mr. A. W. Barrett said the case he wished to relate to the Society was interesting as it shewed that the value of electric illumination of the mouth in the diagnosis of antral abscess was not always reliable. Some three weeks ago a sister in the London Hospital was referred to him by Mr. Hovell for puncture of the left antrum, for what was believed to be an empyema on that side. The patient said that every morning from 9 to 12 a discharge of fetid muco-purulent fluid escaped from the left nostril and slightly from the right, and also passed into the back of the throat. There was no escape of pus during the night, nor when the head was inclined to other side. The discharge had lasted for four years, and her health had greatly suffered in consequence. There was no special pain complained of, nor was any swelling perceptible. The mouth was quite free from stumps and decayed teeth, and was in a perfectly healthy condition. All decayed teeth and stumps had been removed two years ago. Examination with a powerful electric mouth lamp attached to an eight cell storage battery showed an equal amount of translucency through each cheek. This was repeated on four occasions, always at different times of the day, and in the presence of three surgeons in addition to Mr. Barrett. Relying too much on this supposed aid to diagnosis, Mr. Barrett ventured to think that the left antrum was in a normal state, and in this opinion his friends agreed, and this was in opposition to the view of Mr. Hovell. However, at Mr. Hovell's request Mr. Barrett perforated, and thereupon a copious discharge of very fœtid yellow muco-

purulent fluid was poured forth from the left antral cavity. Mr. Barrett thought that the lesson one might learn from this was that one should not rely upon the supposed power of a purulent collection to obstruct the rays of the electric lamp.

The PRESIDENT said that he should be glad to hear any remarks upon the case from members present. On several occasions they had had illustrations of electric and other illuminations as a means of detecting antral disease. Both Dr. Scanes Spicer's and Mr. Arthur Underwood's communications on the subject would be remembered.

Studies on the Growth of the Jaws.

By C. S. Tomes, M.A., F.R.S.

In the Museum of the Royal College of Surgeons there is a series of models which, so far as I know, has hardly received the close attention which it deserves. It was prepared by the late Mr. Merryweather, and consists of a very complete set of models of the same mouth, beginning at the age of 4 and continuing up to the age of 21, the models being taken at short intervals during all the earlier years, and at longer ones during the later period of the term. I believe the series to be unique, and great value was attached to it by Mr. Merryweather, who never allowed anyone access to it.

It affords a means of checking various more or less theoretical conclusions, as to the methods of growth of the jaws, which have been drawn from the study of separate dried specimens, these conclusions themselves having a very direct and practical bearing upon the subject of the treatment of irregularities. In the first edition of his "Dental Surgery" my father pointed out that it was possible, by a series of measurements of a

large number of children's jaws (the specimens upon which he worked being now nearly all deposited in the museum of this Society), to ascertain in what directions increase took place and in what it did not; and although these researches have obtained general acceptance and have hardly been seriously combated, it will nevertheless be interesting, and indeed may serve to still further emphasise them and to convince those who may perhaps be inclined to think that considerations of this nature do not greatly influence our every-day practice, to somewhat closely study this series. And first I would remind you that the most important generalisation then drawn was that in the region of the jaws occupied by the twenty temporary teeth very little growth or change subsequently takes place, so that it comes to pass that the incisors, canines, and bicuspids ultimately occupy an arch which hardly differs either in size or shape from that occupied by their predecessors.* If, then, in the treatment of irregularities, whether threatened or accomplished, we expect improvement due to growth in this anterior region of the

* It is not generally known how slight an increase in the arch allows of the replacement of the deciduous teeth by their apparently much larger successors. Measuring the space occupied by the temporary teeth of this series along the centre of their grinding surfaces I find it to add up to 35 millimetres, and that by the permanent teeth which replaced them only to 37 millimetres. A very slightly more outward position would easily accommodate this small difference.

mouth we shall be disappointed; yet how seldom, if we read the lengthy and involved dissertations which from time to time appear upon this subject, is this fundamental truth fully grasped.

It may be thought that this point about the very small growth of that portion of the jaws occupied by the temporary teeth had been already proved *ad nauseam*, and that anything more was superfluous. But the proofs adduced have been based upon measurements of dried jaws, or else are averages taken from a number of children and a number of adults. Now there are several possibilities of fallacy in such averages—thus it is difficult to be certain that the children and the adults belonged to the same grade of society, as the former would probably be gathered in some institution. Or it is possible that the children giving the smallest measurements were puny and stunted, and that few of them would survive to be represented amongst the adults. And therefore, notwithstanding the concurrence of all the evidence thus accumulated, the record of what actually happened during the growing up of one individual is well worth the trouble of close examination.

My father's research was conducted principally upon the lower jaw, this affording convenient points of measurement not existing in the upper jaw. I have, therefore, in my study of this series

of models, devoted my attention to the upper jaw, this course appearing to afford the best check upon the older observations. In order to give as much precision as possible to my examination, I selected points for measurement, which should be, as far as may be, applicable equally to models and to macerated jaws.

For width I took the distance between the middles of the grinding surfaces of the second temporary upper molars, and, afterwards, of the second upper bicuspids. For length I took the distance from the middle of the back edge of the grinding surface of the second temporary molar to the centre of the back of the neck of the central incisor of the same side, at the point where the gum joins it. The results are here tabularised.

Years.	Length.		Width.
4 ...	Right 26.6 mm.	Left 26.5 mm.	... 40 mm.
6 ...	,, 26.5 ,,	,, 26.5 ,,	... 39.5 ,,
10 ...	,, 27.3 ,,	,, 27 ,,	... 40 ,,
12 ...	,, 27.4 ,,	,, 27 ,,	... 40 ,,
13 ...	,, 27.2 ,,	,, 26 ,,	... 14 ,,
15 ...	,, 27 ,,		
16½ ...	,, 25.3 ,,	,, 23.5 ,,	... 41 ,,
21 ...	,, 25.8 ,,	,, 23.2 ,,	... (41) ,,

It will be noticed that there is a difference in the length measurement on the two sides, to which I shall recur later; and that the width measurement at the age of 21 is enclosed in brackets. This is done because it is not the actual, but a corrected measurement; the second bicuspid on

one side is displaced a little inwards, and this has been allowed for. I may mention also that there are some thirty models, all of which I measured; a few are disturbed by loosening temporary teeth, visibly displaced, and these I have rejected, those given being enough to illustrate my point. If we proceed to summarise the data before us we find that in the region occupied by the temporary teeth, there was from the age of 4 up to 15 only a very slight gain in the length—not quite a millimetre—whilst in width there is about the same.

Up to this time the course of nature had not been interfered with, but the mouth being somewhat crowded at the age of 15 the first upper bicuspid on the left side was extracted, with the result that at $16\frac{1}{2}$ the left length has fallen two and a half millimetres, but what is very remarkable, the right measurement (no tooth having been extracted) has also fallen more than a millimetre; and this diminution proves to be permanent, as at 21 the measurements are the same. An examination of the lower jaw leads to the same inference, namely, that there is no increase whatever in the portion of the jaw occupied by the temporary teeth, but in this there were points to which I shall have to recur.

Having thus far met with full confirmation of the accepted ideas, it occurred to me that it would

be interesting to see what happens during the growth of the anthropoid apes. For this purpose of course there are only skulls of different individuals to be obtained, but fortunately the data obtainable by taking measurements from a good many individuals and averaging them are sufficiently striking. An examination of all the skulls in the College of Surgeons' Museum shows that in this respect, as in other points in its dentition, the chimpanzee comes nearest to man, though in it the growth in the region in question is marked enough :—

CHIMPANZEE.

Temporary dentition complete	Length 27 mm. Width 30 ,,
Adult Females	Length 33 ,, Width 45 ,,
Adult Males	Length 37 ,, Width 50 ,,

Thus, whereas in man there is practically no gain, in the female Chimpanzees there was 6 mm. in length, and 15 mm. in width. In the larger males there was 10 mm. length, and 20 mm. in width.

In the orang I found :—

Deciduous dentition complete ...	Length 33 mm. Width 35 ,,
Adult Females	Length 38 ,, Width 48 ,,
Adult Males	Length 44 ,, Width 58 ,,

And in the gorilla:—

Deciduous dentition complete	Length 33 mm. Width 33 „
Adult Females	Length 41 „ Width 50 „
Adult Males	Length 47 „ Width 53 „

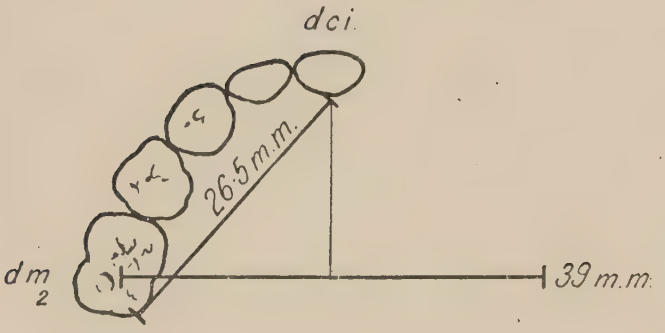
It seems, therefore, clear that in the matter of the absence of growth in the anterior region of the jaw, man stands alone, the orang differing from him more than the chimpanzee, and the gorilla still more, gaining no less than 14 mm. upon an original measurement of 33.

Now it is, of course, well known that in man the suture separating the intermaxillary bone from the maxilla anchyloses early, and is no longer traceable. In the anthropoid apes it remains open, though in the chimpanzee it disappears more or less completely. It seemed to be desirable to trace the growth of this bone, in order to see whether that is the main factor in bringing about the difference, and I have constructed a series of diagrams to bring this and the other measurements graphically before you.

In all of these diagrams the horizontal lines give the width between the centres of the grinding surfaces of the second temporary molars and afterwards of the second bicuspids; the oblique lines the measurement from the centre of the back edge of the second temporary molars to the back of the neck of the central incisor of the same side, and in the case of the apes the strong vertical line the antero-posterior length of the inter-maxillary bone.

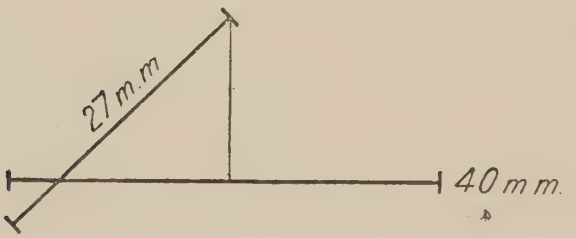
MAN.

Æt. 6.

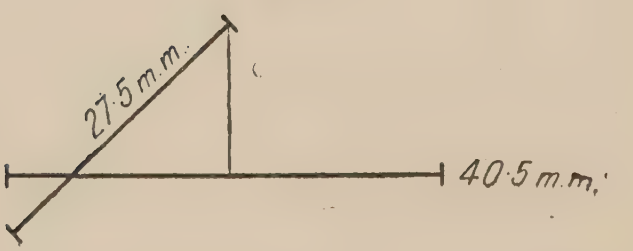


The oblique line should have started from the middle of the back edge of dm_2, not from its corner.

Æt. 13.

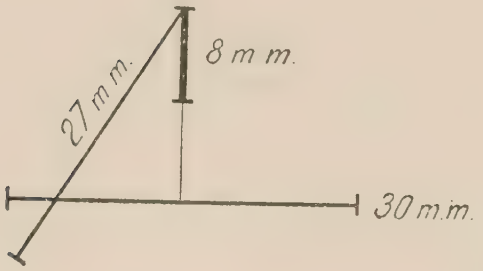


Æt. 21.

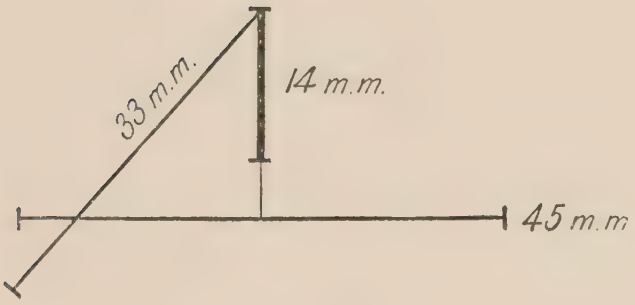


CHIMPANZEE.

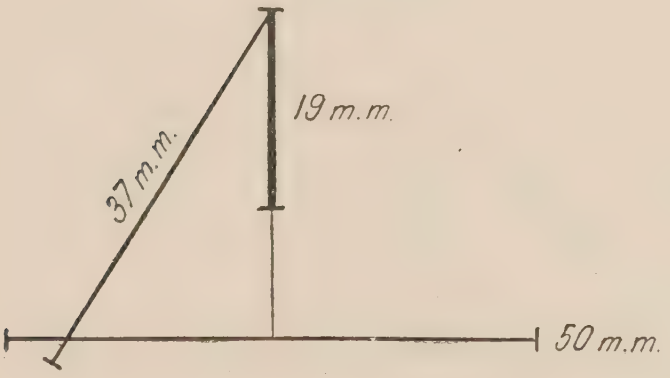
Deciduous Dentition.



Adult Female.



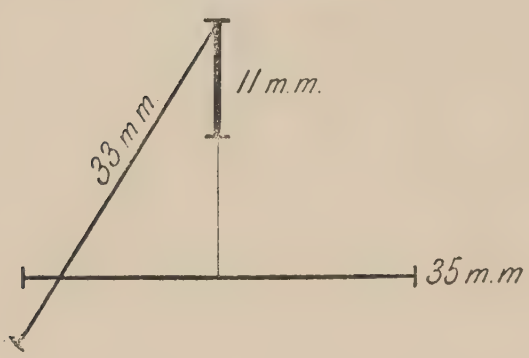
Adult Male.

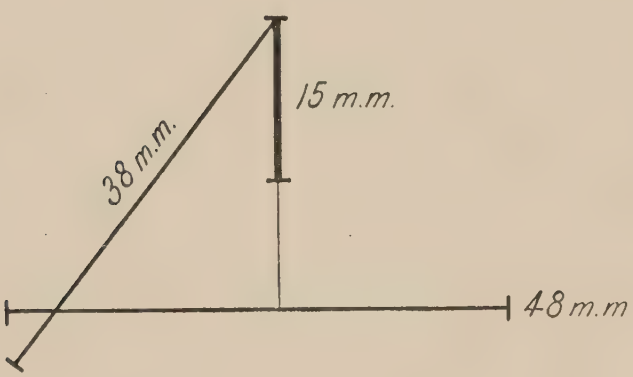


ORANG.

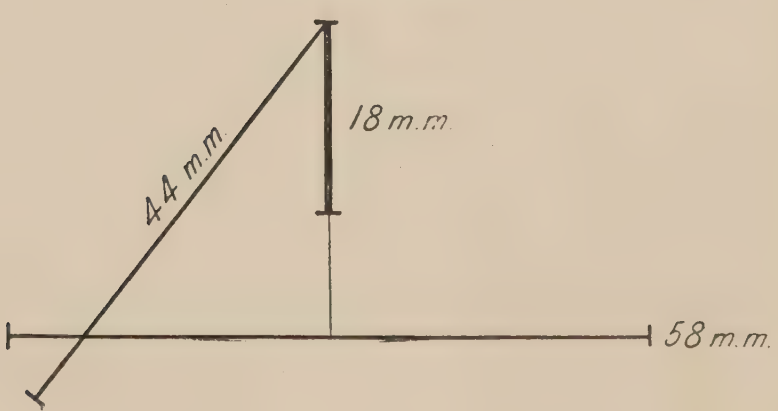
Deciduous Dentition.

Adult Female.





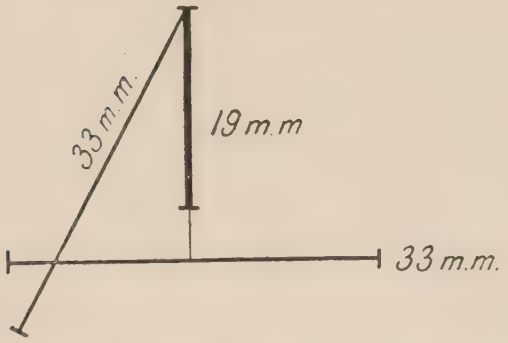
Adult Male.

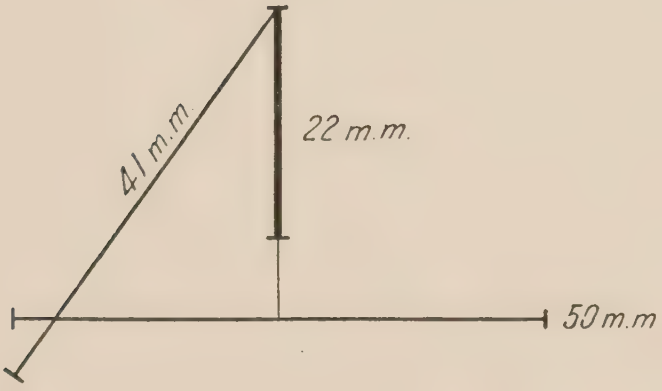


GORILLA.

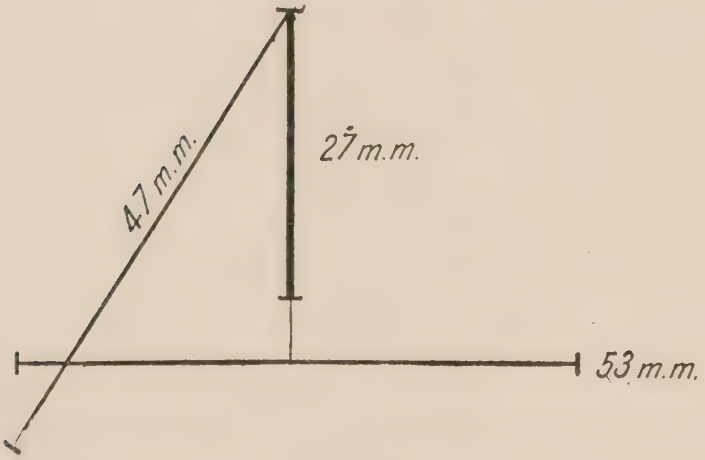
Deciduous Dentition complete.

Adult Female.





Adult Male.



The mark on the vertical line represents the length from before backwards of the intermaxillary bones. From it you see that in the chimpanzee it grows from 8 mm. to 14 in the female, and 19 in the male. In the orang from 11 to 15 and 18; in the gorilla from 19 to 22 and 27. Its elongation, therefore, in the chimpanzee, is enough to effect the whole increase in length forwards, but it is not so in orang and gorilla, in which there must be growth on that edge of the maxilla itself, and a forward movement of the whole bone bodily. Tracing this out with greater care I found that from the period at which the deciduous teeth were all in place up to the period at which the first molar was cut, growth was most active, and the greater part of the increase was already attained, but that it was not complete till the attainment of the full permanent dentition.

As in man there is no growth in this direction, and in chimpanzee less than in orang and gorilla, and this corresponds with the periods of obliteration of their intermaxillary sutures, it seems a fair inference that these two facts are related as cause and effect, and, so far as it goes, is a good argument against interstitial increase of size taking place in bones.

And it may be further observed that the elongation of the intermaxillary bones bears an

apparent relation to the extent of development of the canines, whether we compare different genera, or the two sexes of the same genus, so that it would seem that in the upper jaw the space for them is thus provided.

Of course the smaller measurements obtained for the adult females are partly due to the smaller size of the animals, but more particularly have relation to the difference in the sizes of their canines.

And I may say of all these measurements that, although averages of a good many specimens, I attach little importance to the absolute dimensions given; for some purposes the points chosen may have been badly selected, but as they are the same in all the specimens they at all events serve for comparison.

It would be very interesting to ascertain if the prognathism of the African races, can be due to the intermaxillary suture remaining open to a later date than in European races, but there is no material in this country, that I am aware of, for ascertaining this.

To return to our series of models, it is in some ways to be regretted that the mouth in which they were taken did not turn out to carry regular teeth, for it might be said that the crowding which obtained here was due to a want of growth which in a normal mouth would have taken place.

But there is another and sufficient cause for that amount of crowding which did occur; the upper incisors, instead of taking their usual slight forward inclination, remained vertical, in that position which we are accustomed to regard as appropriate to the temporary teeth, and this of course involves a slight loss of space; while the lower incisors, very soon after their eruption, rose up so as to touch the gum behind the uppers, and this, the uppers being too vertical, necessarily involved the lowers having a distinct lean backward. The result of this was that it became necessary to extract a bicuspid on each side, so that there was at the last a material shortening of the measurements in the lower jaw. And though I at first regretted that the mouth was not strictly regular, I afterwards came to be glad that it was not, for a closer study of its irregularity lead to some interesting suggestions.

In the table of measurements it will be observed that after the age of 12 there is an inequality between the length of the two sides, and this inequality had established itself, although exactly the same teeth had been shed and retained upon the two sides.

Now this is very interesting, because any one looking at the mouth a few years later would have certainly attributed it, without the least hesitation, to the extraction of a tooth on that side. That

such a verdict would have been quite wrong is evident, for here we see the first molar advancing on one side and not on the other, although both sides have the same teeth, and there are no interspaces.

It seemed, so to speak, predetermined while the second bicuspids and the canines were still within the bones, and their predecessors still in place, and it may possibly have been due to their position in their crypts, but certainly not to anything that happened above ground.

These teeth were late in being erupted, but their predecessors held the ground for them, and the second deciduous molar is actually bigger than its successor, so that their late eruption fails to account for it.

Again, I have alluded to the uprising of the lower incisors ; this also is foreshadowed pretty early, immediately prior to the shedding of the temporary teeth, and it is fully established at the age of 11, when the lower incisors (the second temporary molars still persisting) have risen up so that they are too high by at least their own length. Now that this was due to some inherent vice, and not merely to their not having met the opposing teeth, is shown by their having been forced to take a very backward inclination by having impinged upon the backs of the upper incisors. I do not wish to build too much upon an indi-

vidual series of specimens, but it seems that so much can perhaps be learnt from such a series that I would urge those who may have the opportunity to take models of the mouths of their own children from the ages of 6 onwards to maturity; so far as I can see there is not much to be got by taking them earlier, and a model a year up to the age of 14, and then one every two years, would amply suffice.

In conclusion, the two points to which I would call attention are (1) that the early attainment of its full dimensions by the anterior portion of the jaw is an essentially human character; (2) that in the study of irregularities a too mechanical view of their origin is to be deprecated; their origin is probably to be sought earlier than we are accustomed to look for it, and its more early recognition may perhaps help us to combat it more efficiently. In this mouth the articulation was fairly complete in its crowded condition, and became less so after the extractions and subsequent attainment of regularity in the teeth of the two jaws taken separately; perhaps an earlier recognition that extraction or some other treatment would be called for would have eventuated in a more perfect articulation.

Discussion.

The Chairman, in inviting discussion, said that he feared the subject was one which they could better discuss after careful perusal of the paper.

Mr. F. J. Bennett wished to know if the diminution in length of one half of the jaw, mentioned by Mr. Tomes, was actual or only relative to the increased length of the opposite half.

Mr. A. W. Barrett asked how it was that the square aspect was produced in the growth of the bone, looking at the diagram it rather suggested that it would give it a pointed appearance?

Mr. H. T. Reed asked if the length was due to the prominence in the canine region?

Mr. Paterson wished to know if Mr. Tomes had examined any case amongst human jaws for the persistence of the suture line, normally existing in most other Primates, between the pre-maxillary and superior maxillary bones; and if so, whether he had observed any malposition of the teeth of the incisor region in connection with such persistent suture. He (Mr. Paterson) had a portion of a human skull, perfect as far as the upper jaw was concerned, of an age when the wisdom teeth were erupting in the arch, in which such a suture line existed, and in that case there was no anterior protrusion of the teeth.

Mr. Ackery enquired whether there was any marked difference subsequent to the extraction of the first bicuspid, and owing to the centre of the mouth being shifted over to the left side?

Mr. W. Hern wished to know if Mr. Tomes had noticed whether the diminution of length, from the line of the

temporary molar to the incisor, had any relation to the eruption of the twelve year old teeth?

Mr. W. A. Maggs said that a point occurred to him, which gave *prima facie* corroboration to the results of Mr. Tomes' investigation. It was that the diastema is much larger in adult than in pre-adult life in anthropoid apes, and this being limited to the premaxillary bone, it showed that the growth of the superior maxilla in the anterior direction is practically confined to the premaxillary region.

The Chairman said that the paper and the discussion upon it had very forcibly impressed upon him the enormous amount of information which Mr. Tomes had gleaned from this apparently simple set of models, showing how valuable such models might be, and how much knowledge might be got from them. He had only one question to ask, and that was with regard to the inter-maxillary bone, which Mr. Tomes had said after a certain age ceased to grow. He (Mr. Hepburn) had formed a sort of idea that protrusion was principally associated with the inter-maxillary bone, and that it reached its greatest development about the age of eight, if the natural growth of the bone ceases before that period, that would not preclude the possibility of abnormal growth taking place afterwards, it might account for the protrusion of the teeth. In the example which Mr. Tomes had shown them of the chimpanzee the squareness of the inter-maxillary bone seemed to do away with the protrusion which might be accounted for by the enormous size of the diastema.

He should like to know if Mr. Tomes had formed any opinion as to the real seat of the increase of bone, whether it arose from pressure or from abnormal proliferation of bone cells?

Mr. Tomes said that before replying to the various questons, he would say that whether there is any persistence of the intermaxillary suture in the prognathous African races for a longer period than in European races, is not known, the material for investigation, so far as he was aware, did not exist in England. There were plenty of adult specimens, but very few of babies; possibly in the American Museums

there might be such specimens. Mr. Paterson had mentioned that he had an adult skull in which a suture was persistent. Of course such skulls were to be found here and there, but he was not quite sure if that would affect the argument very much. Supposing a suture that is normally obliterated did remain, it did not follow that the growth was going on in it. There are plenty of sutures which remain sutures, but in which growth was not going on. They had no material to say whether the irregularity which they called anterior protrusion was or was not due to this cause. He read this short paper now because it seemed to him to hang naturally to the discussion which had taken place at a previous meeting upon anterior protrusion.

Several questions had been asked about measurement. Mr. Bennett asked whether the diminution was relative or absolute. Well, it was both, it was absolutely less in the adult than in the child of six, but as Mr. Ackery pointed out, there was a shifting of the centre. Mr. Tomes thought there was a *vis a tergo* that side, which shifted the teeth forward. All that he wished to emphasise was that the ultimate diminution, which was pretty large, might have been due to the extraction. Yet this diminution was beginning at the time when all the temporary molars were still *in situ*. Then he had been asked as to the prominence of the canines. Well, with reference to that they were rather prominent, but they ultimately became fairly regular. He should like to endorse a remark made by Mr. Hepburn, who had anticipated what he intended to say, viz., that sets of models of the same mouth at different periods of growth would be most valuable. He thought there was nothing, apparently, to be learnt, prior to the age of six; from that age up to 12 yearly models might be taken, so that it would not be a very laborious matter, and unless he was very much mistaken there would be much learned from them. Mr. Barrett had spoken as to the squareness of the jaws. In presenting the matter to them very briefly, he (Mr. Tomes) had perhaps made it too diagrammatic and possibly over stated it, in his desire to be clear, and Mr. Maggs pointed out that the large diastema necessitated consider-

able squareness. Mr. Tomes was afraid that he did not make himself quite clear about the chimpanzee. It has the most human dentition, and it is the only ape in which the intermaxillary suture becomes obliterated at an early age.

Votes of Thanks.

The usual votes of thanks concluded the meeting.

The next meeting of the Odontological Society will be held at 40, Leicester Square, on Monday, May 2nd, at 8 p.m. Casual Communications:—Mr. S. A. Coxon, "A Case of Cystic Sarcoma of the Superior Maxilla" (Sir William MacCormac will kindly speak)—patient in attendance; Mr. Stanley Boyd, "Suggestion of a plan for preventing Lateral Displacement of the Chin after removal of a Portion of the Lower Jaw"—with case; and "A Case of Removal of one Condyle of the Lower Jaw for Closure of the Jaws"—patient shown; Mr. E. W. Roughton, "An Ivory Exostosis removed from the Lower Jaw."

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING,

May 2nd, 1892.

Mr. J. H. MUMMERY, M.R.C.S., L.D.S.

President, in the Chair.

The Minutes of the last meeting were read and confirmed.

Messrs. J. E. Harris and Edmund Balding, Jun., signed the Obligation Book, and were formally admitted to the membership of the Society by the President.

The following gentlemen were ballotted for, and duly elected :—

Resident Member :—Mr. Harry Davis, L.D.S.Eng., 14, Church Road, Richmond, S.W.

Non-Resident Members : — Messrs. David Thomson, L.D.S.Edin., 15, Gt. Marlborough Street, W., and Philip Burdett Reading, L.D.S.Eng., Elizabeth Street, Hyde Park, Sydney, New South Wales.

The Librarian (Mr. Ashley Gibbings) stated that the Society had received the following books :—*Transactions of the Odontological Society of Germany ; Official Year-book of the Scientific Societies ;* a treatise on "Harelip and Cleft Palate," by Mr. William Rose, F.R.C.S.

The Curator (Mr. Storer Bennett) announced that he had received two teeth, presented to the Museum by Mr. Oswald Fergus. In each case, the tooth was a first lower molar possessing three fangs.

Mr. Storer Bennett also exhibited, and deposited in the Museum of the Society on loan, the skull of a Malayan Bear (*ursus malayanus*), which showed evidence of having suffered from three extensive alveolar abscesses, arising from three out of the four canine teeth.

The left upper canine was broken short off at the neck, and pus had thus been able to escape through the exposed pulp cavity, the surrounding bone was therefore but little impaired. The abscess connected with the right upper canine had burst into the nose, involving considerable destruction of osseous tissue. A remarkable point about this tooth was, that although the apex had been completed, and the end of the tooth and its inner side were intact, there was considerable destruction of the thin outer side over an area of quite half-an-inch.

An abscess was also situated at the end of the left lower canine, but here the end of the root was quite open, no attempt at closure having occurred. The bone of the lower maxilla beneath the tooth was extensively excavated, and masses of new bone were thrown out from the edges of the cavity, partly bridging it over.

The bear had been kept in captivity, and Mr. Bennett took it that the reason why so many wild animals that had been caged developed multiple abscesses, was that the irritation caused by the trouble with the first tooth was so great that it caused them to grind their teeth against the bars of their cage, and thus much more extensive damage was done subsequently. In this instance, Mr. Bennett was of opinion that the first canine was initially affected.

Mr. S. A. Coxon narrated "A Case of Cystic Sarcoma of the Superior Maxilla."

Mr. Coxon said the patient about to be brought before the society was one in whom the disease was associated with dental lesions, but ultimately revealed itself as

" cystic sarcoma." The preparation of the tumour had been lent by the Dean of St. Thomas's Hospital. The case was brought to Mr. Coxon's notice by a colleague, Dr. Langton, on November 7th, 1890. The disease gave the patient very much the appearance that would have been caused by placing a large walnut under her upper lip. The growth was elastic to the touch and had a blueish red colour. The patient said it had been forming for three years and commenced above a carious tooth and had gradually grown larger. As she was pregnant she was anxious to avoid an operation ; but her mouth gave her considerable uneasiness and pain. After taking into consideration the length of time the enlargement had taken to arrive at its present size it was hoped that it was not of a malignant nature. It was ultimately decided to open the swelling and this was accordingly done on the following week, Dr. Langton giving chloroform. An incision was made right through the centre of the cyst ; a small amount of glairy fluid was discharged on the entrance of the scalpel and after that considerable hæmorrhage occurred. The cavity was plugged with " carbolized tow " which was changed every second day and the cavity thoroughly syringed out. Subsequent to this the swelling decreased to some extent and it was hoped that in time it might disappear. At the operation, Mr. Coxon cut away a small piece of the tissue, forming the wall of the cyst, and subjected it to a microscopic examination. The section was a very poor one and it was therefore impossible to attach much importance to its examination, but at the same time it gave an unpleasant feeling that it was myeloid. In December the swelling had not perceptibly increased, and in January its true nature became apparent. The patient was sent up to St. Thomas's Hospital, and on the 17th, Sir William MacCormac removed what proved to be a perfectly encapsuled tumour. The patient was very little disfigured by the operations, the incision was made at the angle of the mouth and not through the upper lip.

The denture she was wearing was made in such a manner, that while it fitted round the edges and held out the lips, it

did not bear upon that portion from which the tumour had been removed, thus avoiding any possible recurrence from friction or pressure.

The denture was made in the following way :—A piece of pure tin was taken about one sixteenth of an inch thick, struck down to the model of the mouth, over the portion which it was wished the vulcanite should not touch. It was packed in the ordinary manner and when the case was vulcanised, the tin was peeled away leaving the vulcanite with a hard polished surface but not in absolute contact with the part.

Mr. Coxon added that since the operation, the patient had given birth to a fine healthy child. Mr. Coxon believed this to be only one in many cases that came under the notice of dentists, and he feared that they often shrank from impressing on patients the necessity for an operation in such cases. It was of little use simply saying " You ought to see your doctor or a specialist about this," as the inevitable tendency was to shrink away from an operation, but it was their duty to see that the patients had medical advice, for early attention had saved the life of numbers of fellow creatures. Many little knew the danger they were in until too late.

Sir Wm. MacCormac, being called upon by the President, said that he did not know that he had much to add to the description of the case. The patient, when she came under his notice, evidently had a central tumour of the upper jaw, presenting itself on the outer side of the alveolus. It was thought that probably it would prove to be a myeloid growth, and after examining it and deciding what had best be done, he removed it by clearing away the tissues all round, and thoroughly removing it beyond the limit of growth. This was readily done by making an incision near the angle of the mouth. The tumour was very completely encapsuled, and it came away without difficulty. In his experience myeloid tumours were much more rare in the upper than in the lower jaw; and this he thought would show itself of the least malignant type of sarcomatous tumours. Mr. Coxon had mentioned that the operation had resulted in very little deformity, Sir

William MacCormac thought, that in this case there was no need of it ; the angle of the incision could be made either shorter or longer in one cheek, and in this way almost any growth could be removed from either the upper or the lower jaw, there need not be any unsightly scar left. It was perhaps a matter of detail, but it was of great importance to bring the edges of the mucous membrane together very accurately, for primary union then took place much more rapidly. Partly on this account, and partly owing to the very admirable way in which Mr. Coxon had fitted the artificial piece, he thought that when they saw the patient they would say that very little deformity was apparent.

Mr. Frederick Eve suggested that for the sake of clearness, Mr. Coxon might slightly modify the title of his communication : the term " cystic sarcoma " was originally used for epithelial tumours—multilocular cysts originating in the epithelium. Mr. Coxon's case was really one of " Central Myeloid Sarcoma of the Jaw," and he would suggest it should be so described.

Mr. Stanley Boyd asked Sir William MacCormac if a median incision carried into the nostril would not have given better access than the one made.

Sir William MacCormac thought the incision made was the better one, though the one suggested would have been necessary had the tumour been more extensive. By his incision he had limited the scar more than would otherwise have been possible.

Mr. Stanley Boyd, F.R.C.S., then read a communication, entitled, " Suggestions of a plan for preventing lateral displacement of the chin, after removal of a portion of the lower jaw."

Mr. Stanley Boyd said: In bringing the following case and remarks before you, I must ask for some indulgence, for the subject upon which they bear is still in quite a plastic state in my own mind. I should not, indeed, have ventured to submit it to your criticism, had I not received

a call from your energetic Secretary, and a request that I would help him in his task of providing food for the Odontological Society. I had not by me at the time any series of cases which seemed likely to be of interest to you, nor was I prepared to add anything to our knowledge of some abstract or scientific subject of common interest. But a case had recently been placed under my care by my colleague, Mr. J. F. Colyer, which had suggested to me that it might be possible in certain cases of removal of a part of the lower jaw, to prevent some of the distressing deformity which results from that operation—especially the deviation of the chin from the mid-line; and as the result is due partly to Mr. Colyer's work and partly to mine, I hoped that the subject would be regarded as suitable for discussion by this Society.

It would be hard, indeed, to have to confess complete inability to deal with so striking a deformity, at a time when plastic surgery is so far advanced. When an ivory knee-joint has been substituted for the real article, and the possessor has been able to walk and to bend the joint through a considerable angle, it would at first sight appear to be an easy matter to build up a piece of a jaw. But we all know that asepsis is of the first importance in obtaining encapsulation of a foreign body, and that it is practically impossible to obtain this when a wound communicates with the mouth.

Moreover, even in parts where asepsis is easily obtained, and where one can without difficulty implant pieces of bone and periosteum, absorption of the graft and of any new bone which may at first have developed from it, has been the usual result. The best results have undoubtedly been obtained in the skull, where discs of bone removed by the trephine, replaced, whilst the bone-cells are probably still living, between vascular and perfectly aseptic surfaces of periosteum and dura mater, generally heal in and retain their bony character. Much more rarely an attempt to build up part of a long bone has succeeded, as when Macewen built up the lower end of an ulna with bits of bone obtained from osteotomies on ricketty children; and it

seems clear that a piece of young, growing bone thus transplanted has a much better chance than a piece of adult bone of holding its own; and this chance is probably increased by the presence of periosteum on the graft, and on the undersurface of the flap beneath which it is to be placed.

In the case of defects of the jaw it would be only in the rarest cases that we could hope to fulfil the requirements for success with living bone grafts; and this no doubt has given rise to the feeling that it is hopeless to try and prevent displacement of the chin after resection of a portion of the jaw. Dentures of all kinds have, of course, been tried, but they get only a superficial, and, often, a very poor hold, so that they fail to counteract the force with which the shrinking granulation tissue drags together the sawn ends of the bone—just as our splints and bandages fail, under much more favourable circumstances, to prevent the contraction of a burn-scar. To succeed in preventing this contraction, dentures must be assisted by some kind of spanner between the bone ends. The question to be decided was whether a bar of some unabsorbable material could be got to heal in? At first I did not venture to try for this, but started with the idea that I should have ultimately to remove the spanner; but accident, as you will see, shewed that this may not be necessary.

Mary T., aged 20, had one of the front teeth in the left side of the lower jaw removed in October, 1889, to make room for another tooth. About two months after this she noticed a small tumour on the inside of the gum, near the seat of the extraction. It grew slowly for ten months when it had reached the size of a large Spanish nut. She then went to the Dental Hospital and was sent on to me at Charing Cross by Mr. Colyer. She was in the Hospital only from Saturday to Monday, and no notes were taken; but I remember that a ridge could be felt in the jaw, running down from the base of the growth near the line of the fang of the first bicuspid. A tooth was drawn on each side of the mass, it was then cut away freely with forceps and a gouge was used along the ridge above mentioned.

It was hoped that this treatment would be sufficient to prevent recurrence, as the growth seemed to be of myeloid nature.

But it reappeared after six months, in April, 1891, on the outside of the gum, about the second bicuspid (no doubt in connection with the ridge above mentioned), and increased rapidly, with attacks of sharp pricking pain.

She was readmitted on May 12th. There was then a tumour on the left side of the lower jaw pushing forward the lip; it involved the jaw from near the midline to the first molar tooth and infiltrated the substance of the bone somewhat deeply, "expansion" being more evident towards the outer than towards the inner side; but the lower edge of the jaw and the bone for a short distance above it were normal. The growth was lobulated on its free surface, smooth where it lay between the plates of the jaw, not ulcerated and not tender. The accompanying photograph shews the state of matters.

The growth had thus declared its real malignancy and a free operation was evidently necessary; yet I was most anxious, if I could safely do so, to avoid breaking the continuity of the arch of the jaw. Accordingly, in order to see clearly the limits of the growth, the left central incisor and first molar having been drawn a vertical incision was made in the mid-line of the chin downwards from the groove between the lower lip and the mental prominence and then outwards along the lower border of the jaw to the masseter, the flap was raised and the mouth opened into all along; the jaw was sawn nearly through, just to the left of the mid-line, and through the socket of the first molar, and then with Liston's cross-cutting forceps a transverse cut was made below the base of the growth through what seemed to be healthy bone between it and the edge of the jaw. The tumour was thus separated from its attachments and removed, but the little bridge of bone (the lower edge of the jaw), which I counted upon to preserve the arch of the jaw was broken away at either end; this was fixed in its natural position by wire sutures to the two main fragments, and the short ends of the sutures were brought out through

the superficial incision. To them are due the two deep puckerings in the line of the scar, and it is obvious that in future such stitches should either be cut short or the ends should be left in the mouth. To avoid deformity, union by first intention all along the skin wound should be obtained. I removed these two stitches after eight weeks, and the jaw then had quite a normal contour and was firm.

Unfortunately recurrence again took place about the last molar tooth, it was not extensive, and the bar of bone, which had been saved below the second growth, seemed quite healthy; but I felt that I ought to seriously endeavour at the third operation to secure immunity from recurrence and determined to remove this bar of bone as well as the new growth. Had not the patient still begged me to avoid deformity, if possible, I should probably have removed the rest of the left-half of the jaw. As it was, on December 26th, 1891, seven months after the last operation, I opened up the posterior part of my old incision and extended it backwards to the angle of the jaw, separated the soft parts upon each side, removed the bar of bone and about $1\frac{1}{2}$ inch of the jaw, trenching largely on the base of the coronoid process. Partly to prevent flexion of the posterior fragment, partly to keep the two fragments apart until, at all events, a denture could be fitted, I broke off a piece of a stout steel knitting needle of suitable length and used it as a spanner, fixing the hinder end in the dental canal and the anterior end in a pit bored in the anterior fragment. Mucous membrane and skin were sewn together separately over this and the jaw kept at rest. A small sinus in the skin wound remained and was attributed to the presence of the needle, therefore after six weeks or so I endeavoured to remove it, both from outside and from the mouth, but I could not feel it anywhere. So I determined to wait and watch. The pricking and other abnormal sensations which the girl complained of disappeared at once and the wound soon healed completely.

Mr. Colyer's share of the treatment began three weeks after the operation, when he inserted a vulcanite splint to keep the parts separate. He says that "the mode of making

requires but few words, differing in no detail from that employed in making ordinary dentures. In order to assist keeping the splint in position, it was made to encircle the remaining teeth, and the bite was arranged so as to prevent lateral movements, the patient being recommended to keep the mouth closed as much as possible, and warned not to have it out for any length of time." This splint he has now replaced by an ordinary denture.

I think the result may be described thus: The patient is quite comfortable, she can separate her incisor teeth for at least an inch, and closure of the jaws is performed with considerable force; the chin is in the mid-line, and the bite is perfect; on the left side where the bone is absent the soft parts have fallen in and the depression is specially marked where the projecting wire stitches kept open granulating tracks for several weeks. Above the scar the cheek seems a little swollen, probably from impaired venous return; this swelling is steadily subsiding. The left-half of the lower lip is wasted and causes some unnecessary disfigurement in the front view. I suppose a low branch of the facial was divided, though the incision used seemed unlikely to endanger any motor nerves.

It has occurred to me that in a similiar case some of the deformity on the left side might be avoided by detaching the internal pterygoid from its insertion and allowing the masseter to draw the jaw somewhat outwards, also by using a thicker bar for the spanner, by placing it as nearly as possible on a level with the lower border of the jaw and by having it bent to the curve of the jaw.

I would particularly ask members of this Society for advice as to the best material to use for the spanner.

The PRESIDENT remarked that there were a great many interesting points about the case, and he should like to hear the opinion of members and visitors upon it.

Mr. F. NEWLAND-PEDLEY said he thought Mr. Boyd was to be congratulated upon the success of his case; it was most ingenious and very successful, but it must not be assumed that they had always failed hitherto by processes which were familiar to them. He must admit Mr. Boyd's

plan was entirely new to him. He had always found a difficulty when removing part of the jaw in preventing deviation to the opposite side, and there was no appliance known to them which would keep the chin in position. In a case of removal of necrosed bone, Mr. Newland-Pedley had used the Gunning splint, which was worn by the patient for five months, but in this instance he had the advantage of the periosteum remaining. In another case in which a portion of the jaw containing three teeth was sawn out, he was unable to accomplish anything by artificial contrivance without displacement. The ingenious part of Mr. Boyd's case seemed to be that he managed to pin the pieces together. He should certainly take a lesson from Mr. Boyd's experience.

Mr. J. H. Badcock stated that a somewhat similar case came to him in the autumn of 1890. The patient suffered from necrosis of the lower jaw. He was a patient of Mr. Rose's, who resected a portion of the lower jaw from the periosteum, leaving the ramus. Mr. Badcock saw him some few days afterwards and the chin was drawn considerably to the left side. A Gunning splint was applied but the part left gave so much trouble that Mr. Rose resected that also. The splint, however, did very well. About three or four weeks later the man left for America. At that time the periosteum seemed to be filled with fibrous tissue; here and there one seemed to feel bone. Some six months afterwards Mr. Rose heard from him and he said his bite was all right. Unfortunately nothing further had been heard of him.

Sir William MacCormac (being appealed to) said that he had no experience himself of such a method, and could only do what other speakers had done, viz., congratulate Mr. Boyd on the ingenious contrivance. Of course it could not be expected that in every case a bar of steel would remain harmless in the jaw.

Mr. James Stocken suggested that platina would probably be preferable to steel.

Mr. C. C. Robbins reminded the Society of a case which he brought to their notice some little time back in which a piece of glass had been tolerated in the cheek for thirty-three years, from which he inferred that glass might be a suitable material if properly shaped.

Mr. H. Lloyd Williams recommended a spanner of pure gold, stating that Dr. Kingsley had used it in some of his operations. He also suggested that ivory might be used.

Mr. G. Cunningham called attention to the work already done in this direction by the celebrated French surgeon, Professor Ollier, in conjunction with a very skilled dentist, M. Claude Martin, both of Lyons, and to the latter's book, entitled, "De la Prothèse immédiate appliquée a la Résection des Maxillaires" (Libraire-Masson, Paris). The characteristic feature of the operations detailed in it was that the dentist was called into consultation with the surgeon *before* the operation, so that the prosthetic appliance was made before the operation was performed. With regard to the materials most suitable for such appliances, M. Martin's experience was that vulcanite and platinum had given the most satisfactory results.

Mr. Storer Bennett congratulated Mr. Boyd on the successful termination of his case, if at that time it could be said to be terminated. Mr. Boyd had asked a question as to the most appropriate material for forming a spanner. Without being prepared to offer an opinion on that subject, he (Mr. Bennett) would point out to Mr. Robbins that its brittleness and liability to fracture would make glass unsuitable. Ivory had also been mentioned, but that would be liable to absorption. He would mention that where lead bullets had been dropped into the pulps of living incisors in wild animals, they had given rise to very little irritation, and the ivory had grown close up to them, but where steel bullets had been used quite the contrary had been the result, and the bullets had become rusted. Whether some substance like gold or platina would not be more suit-

able, he thought they had nothing but hypotheses to go upon.

Mr. West thought the great objection to gold and also to platina would be the expense. The objections to a steel bar might be overcome by coating it with lead.

Mr. Sidney Spokes suggested that a vulcanite rod if properly made would be thick enough and strong enough; it would also be non-irritating. It might be used, too, for building up the new part upon if drilled with holes and filled with sterilized sponge.

Mr. J. H. Carter wished to ask Mr. Boyd what he believed had become of the spanner which, when he searched for, he could not find.

Mr. Stanley Boyd said in reply, that in the first place he thought he guarded himself against expressing any opinion that the case had terminated. He felt confident that the spanner was there, and should not be at all surprised to find it emerging in the region of the chin; his conviction was strengthened by the belief that the denture alone could not possibly hold the bones in position. The cases which Mr. Newland-Pedley and Mr. Badcock had mentioned—cases of necrosis—were different to his own, inasmuch as he could not hope for new bone, but must depend upon a permanent spanner. With regard to several suggestions as to material, Mr. Storer Bennett had already replied for him, as to the unsuitability of glass or ivory. Platina and gold, of course, would not oxidize. The work Mr. Cunningham had quoted was one that would naturally be referred to, but its size was somewhat forbidding. With reference to vulcanite, it had not such a smooth surface as steel, which had been selected on that account so that the granulation tissue might get as close to the material to which it was to be imbedded as possible. If vulcanite could be as highly polished and would be strong enough, it would be a very good material—perhaps the strength might be obtained by imbedding a steel bar in vulcanite.

Mr. Roughton, F.R.C.S., read notes of a Case of "Removal of an Ivory Exostosis from the Lower Jaw."

Mr. Roughton showed an ivory exostosis, which he had removed from the lower jaw of a young woman. The tumour had been growing for about twelve years: it was about the size of a small walnut, and was perforated by a canal, through which the mental nerve passed in the recent state. It was removed by sawing it off, on a level with the surface of the jaw. The operation presented no difficulty. The structure of the tumour resembled that of compact bone, but the Haversian systems were more irregular in their arrangement, thus differing from the structure of an odontome.

Mr. Frederick Eve quite agreed with Mr. Roughton that it was not at all likely that the exostosis was an odontome, indeed the position of the growth would exclude odontome from the diagnosis. He (Mr. Eve) thought it grew from the periosteum. Mr. Roughton might see in the Museum of the Royal College of Surgeons one as large as a tangerine orange, but he was not aware that any were as hard as odontomes.

Mr. Stanley Boyd mentioned a little point in the treatment of multiple osteomata of the face; where they threatened to become large if one cut down and removed the periosteum, the growth would probably be arrested.

Mr. Stanley Boyd then read another communication.

E. L., aged 22, was admitted into Charing Cross Hospital, under Mr. Boyd's care, complaining of inability to separate her teeth. After the extraction of a tooth, at the age of 7, she suffered from, apparently, extensive necrosis of the left half of the lower jaw: some external scars remained as evidence, and the left half of the lower jaw was small and ill-developed, as compared with the right. During the progress of this necrosis the jaw became fixed, and no cause other than extension of inflammation from the jaw to the left temporo-maxillary joint could be discovered. Up to the

time at which she entered the hospital, she had lived upon fluids and finely divided solids. In addition to the inequality above noted between the two sides of the lower jaw, it was noted that she could separate her teeth about a $\frac{1}{4}$ inch, and bring them into perfect contact : there seemed to be freer movement in the right than in the left joint. The patient was anæsthetized with gas and ether, the administration of which caused much respiratory difficulty, either increased secretion of mucous and congestive swelling of parts rendered entry of air difficult, or the epiglottis fell back, and the jaw could be neither depressed nor pulled forwards. However, the dyspnœa subsided, and the jaws were separated by screw-gags till the front teeth were about $\frac{3}{4}$ in. apart. This movement was soon lost in spite of a good deal of perseverance with gags, &c.

About a year later the patient was again admitted and the left condyle was excised through a short vertical wound in front of the tragus. Numerous small vessels were cut, and the parts were a good deal matted, so that it was difficult to recognize parts. But the condyle was ultimately removed with a chisel, mallet and elevator. As the last piece was lifted out there was a free gush of venous blood, probably from a tear in the internal maxillary vein. It was easily stopped by pressure. The jaws were then forcibly separated for about $\frac{3}{4}$ inch, and the wound was completely closed and a compression dressing applied. The left eye could not be closed for some time after the operation, and the left cheek swelled considerably from hæmorrhage into its substance ; but union *per primam* was obtained and the patient soon left the hospital. Now, after an interval of two years she was comfortable, and although she could depress the jaw for only half-an-inch she said she could eat quite easily. It must be admitted, nevertheless, that the range of movement resulting from the operation in this case was not as great as could have been desired.

Mr. J. F. Colyer asked if there was any cause for the face being so much larger on that side ?

Mr. Stanley Boyd replied that it was due to displacement of the soft parts and non-development of the jaw.

Dr. H. W. Maunsell (late of Dunedin, New Zealand) said that he had operated on two or three cases of a similar nature. On doing so he found the internal pterygoid was extremely tense, and on scraping this muscle away from its attachments the fixation of the jaws disappeared; it was this in his opinion which caused the difficulty, and not any stiffness about the condyle of the lower jaw.

Mr. Stanley Boyd wished to avail himself of the opportunity which his presence afforded, to ask what is the result of opening an alveolar abscess through the face—of course one would never do this if it could be avoided. Mr. Boyd had noticed that in two cases—one from an upper and one from a lower molar—which had been incised through the cheek, a deeply drawn-in scar developed, causing considerable deformity; but in the course of a few months the depression became very much less marked. If this were the usual ultimate result one need not be so much afraid of incising through the cheek in cases where good drainage could not be otherwise established.

Mr. Frederick Eve said that when nature made an opening a sinus usually existed for some weeks before coming under the care of the dentist. Meanwhile, granulation tissue formed, fibrous tissue again contracted and formed a cicatrix round the sinus. He had occasion at the London Hospital to make an opening through the skin, having previously made it through the mouth. He did not observe any depression in that case, but would hunt it up and watch it still further.

Mr. Jas. Stocken mentioned a case which he said was not quite in keeping with those mentioned. The abscess was just opening and on the point of bursting. He painted it with flexile collodion and applied hot poppyhead fomentations in the month. The abscess burst and there was no further trouble.

Dr. H. W. Maunsell remarked that he had opened abscesses in the face and did not remember any case in which there was any scar-depression or cicatrix. Of course in most of the cases which had been opened by nature the skin died over the abscess and dropped, leaving a very apparent scar behind.

Votes of Thanks.

The usual vote of thanks concluded the meeting.

The next meeting of the Odontological Society will be held at 40, Leicester Square, on Monday, June 13th, at 8 p.m. A Paper will be read by Dr. F. W. Hewitt, "On the Anæsthetic Effects of Nitrous Oxide administered with Oxygen at ordinary atmospheric pressures; with remarks on 750 cases." Casual Communications:—Mr. A. Pearce Gould, (1) "Excision of Dentigerous Cysts *versus* Incision and Drainage;" (2) "Fracture of the Neck of the Condyle of the Lower Jaw, with case;" Mr. F. Newland-Pedley, "Inverted Lower Canine, erupting over Chin;" Mr. J. Smith Turner, "On the Teeth of the Guanches;" Mr. David Hepburn, "An Instrument for Gauging the Length of Canal in Antral Cases;" Mr. S. J. Hutchinson, "Model to illustrate Anterior Protrusion of the Upper Central Teeth;" Mr. F. Canton, "Model showing unequal size of Upper Centrals."

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING,

June 13*th*, 1892.

MR. J. H. MUMMERY, M.R.C.S., L.D.S.

PRESIDENT, IN THE CHAIR.

The Minutes of the previous meeting having been read and confirmed,

The PRESIDENT said that it was his painful duty to have to announce two losses by death since the previous meeting. Mr. Felix Weiss, who had long been a Member of the Society, and had rendered valuable service as Librarian, and also as President, had, as they were aware, passed away a fortnight previously. Mr. Alexander Fothergill, of Darlington, an old practitioner and Member of the Society, had also lately died. He was sure that the Members of the Society would join in the vote of condolence which had lately been passed by the Council.

Mr. HENRY WILLIAMS MESSENGER, L.D.S.I., of Clairville, 47, Rosslyn Hill, Hampstead, was nominated before the Society for Resident Membership.

Mr. WILLIAM RUSHTON was balloted for and duly elected.

The LIBRARIAN (Mr. ASHLEY GIBBINGS) had only to announce the receipt of the *Smithsonian Report* for 1889 and 1890.

The Curator (Mr. Storer Bennett) had received one specimen, a lower vulcanite plate with two clasps for carrying two central incisors. The clasps passed round the two lateral incisors. The plate had been in the patient's mouth fifteen years, and was entirely encrusted in tartar, which had no doubt been deposited and caused absorption of the bone. The plate was embedded in soft tissue, and nothing else. The Society was indebted to Mr. Redman, of Brighton, for this specimen. Mr. Storer Bennett had also just received a specimen which he had not had time to examine; it was a rough cast of two teeth, evidently a case of false gemmation. It was sent by Mr. Wells, of Tasmania.

Mr. A. Pearce Gould, M.S., F.R.C.S., communicated on behalf of himself and of Mr. John Murray, M.D., F.R.C.S., casualty surgical officer to the Middlesex Hospital, the notes of a case of fracture of the neck of the lower jaw.

He said cases of fracture of the neck of the lower jaw were so rare that they need offer no apology for putting on record before that Society one that had been recently seen in the casualty department at Middlesex Hospital.

Mrs. F. S., aged 30, was driving in a dog-cart on the evening of April 10th; the horse took fright and ran away, and the dog-cart came into collision with a cab. Mrs. S. was thrown violently out on to the road, falling on her chin. She immediately felt pain just in front of the right ear, and noticed that she could not completely close her mouth, and that blood was flowing from the chin and lower lip.

The patient came to the hospital next day, April 11th, and she was found to have a deep cut across the chin, exactly over the lower border of the jaw-bone, and another wound completely severing the lower lip.

There was a swelling on the right side of the face just in front of the ear and below the zygomatic arch, which was painful and excessively tender. Any attempt to open or close the mouth caused acute pain, which was referred to a spot just in front of the lobule of the ear, and the patient complained of feeling a "click" when she moved the jaw. The line of the teeth in the two jaws did not corres-

pond, the lower teeth being displaced backwards and to the right, so that the interval between the lower central incisors was below the right lateral incisor tooth. By pressing forwards the right angle of the lower jaw this displacement was corrected, and at the same time crepitus over the neck was plainly felt.

Fortunately, it was not difficult to retain the jaw in its proper position, and the old-fashioned jaw splint and four-tailed bandage were found quite efficient. After three weeks the splint and bandage were discontinued: the patient could then open her mouth so as to separate the incisors about half an inch, and she was free from pain. There was then considerable thickening of the jaw, extending from below the zygoma some way down the right ramus.

On May 30th this thickening was much less, and the movement had improved. The patient was present, and the Members of the Society would be able to feel some slight thickening over the neck of the jaw still left, and to notice that there was now but little limitation of the movement of the temporo-maxillary joint.

There seemed no reason to question the diagnosis in this case. Violence to the chin was known to be one of the two ways in which fracture of the neck and condyle of the jaw was caused. The pain, tenderness, crepitus and swelling, all exactly localised the fracture, and the displacement was characteristic. The mode in which this displacement could be corrected and the thickening from callus-formation also confirmed the diagnosis.

This fracture was stated to be a rare one. In the last edition of Hamilton's classical work on "Fractures and Dislocations" (1891) it was stated that only nine similar cases were on record. In some of the cases the injury had been a fall or heavy blow upon the chin, causing a simple fracture of the neck of the bone. In other cases the violence had been applied to the side of the face, and the neck of the condyle had been broken on the side struck, and the body of the jaw had been fractured on the opposite side. In one case there was fracture of the neck on each side, of both coronoid processes, and at the symphysis. In a case

recorded by Watson, although there was obvious deformity from retraction of the chin, inability to open the mouth and painful crepitus, no treatment was adopted.

The line of fracture had varied in the few cases that had been dissected, but generally it passed across the bone obliquely, and below the external pterygoid muscle. Sir Wm. Ferguson figured an example of a transverse fracture of the neck.

The injury was probably more frequent than Hamilton supposed, particularly when produced by severe violence to the side of the case when it was associated with other fractures of the same and other bones.

The amount of displacement varied considerably; in one case, recorded in 1785, the ramus had passed so far up and over the condyle that this fragment was united by a large mass of callus close above the inferior dental foramen. And Mr. Holmes recorded a case in which the upper end of the ramus was displaced into the external auditory meatus, separating cartilage from bone, and where the abundant discharge of serous fluid from the ear simulated the escape of cerebro-spinal fluid in a case of fracture of the base of the skull.

In some cases the condyle had been found to be very movable in a forward direction; this symptom they did not detect.

The PRESIDENT remarked that it was a very interesting case, but he supposed that it had not fallen to the lot of any one present to see such a case; he should, however, be glad to hear remarks.

Mr. PATERSON had seen a case of fracture involving the ramus of the lower jaw high up, but just short of the neck of the condyle, coupled with a fracture extending through the body of the bone on the opposite side, at a spot immediately behind the canine tooth. The patient, a boy, had been dragged through and severely crushed by machine rollers; other parts, *e.g.*, thorax, &c., were injured. The fractured jaw was kept in a satisfactory and comfortable position by means of a padded, perforated metal chin

splint, applied externally, and a wool pad over the region of the condyle. He (Mr. Paterson), however, had intended a modification of Gunning's splint, with a high outside wing on the side of the fractured ramus, but the patient, after being in hospital seven days, died.

Mr. J. Smith Turner said that there was only one remark that he should like to make, and that was that it was very satisfactory to know that the old four-tailed bandage had not been forgotten; he believed it was a very useful surgical instrument. He might mention another satisfactory point to statisticians and those who were fond of getting figures together, viz., that this was stated to be the tenth case, so that in future they might work their figures in decimals.

Mr. Betts saw a case about a month or six weeks previously. A lady fell from her horse, and was kicked by it under the chin, fracturing the bone between the left incisor and canine. The fracture was done up in a four-tailed bandage. Many of the molars were broken obliquely, as if struck with a chisel and hammer. The patient at the time had very great pain in the region of the condyle, but what led him to mention the case was that neither the molars nor bicuspids met, although the molars were in good position; only the wisdom teeth met.

Mr. Pearce Gould then spoke upon the subject of "Excision of Dental Cysts *versus* Incision and Drainage." He said "The treatment of cysts in various parts of the body has undergone considerable development during the last two decades, and I am anxious to submit to the members of this Society reasons why the cysts in which they are peculiarly interested—simple periosteal and dentigerous cysts—should be treated in accordance with the same general principle that is observed by surgeons in other regions. Cysts in general have been treated by tapping, by injection of iodine, perchloride of iron, carbolic acid, and other irritating fluids; by incision and drainage; by incision and stuffing of the cavity with lint—plain, or soaked in a strong solution of chloride of zinc—and by excision. All ex-

perience shows that only one of these methods of treatment—excision—is certainly and speedily successful. The injection of irritants may, on the one hand, fail to destroy the secreting lining of the cyst, and the fluid may be reproduced, or, on the other hand, it may excite a too severe inflammation in and around the cyst wall, and so lead to serious and extensive suppuration. No surgeon employs injection for a cyst without a vivid sense of the uncertainties that attend its use. Incision and drainage is a very slow means of cure; the cyst wall is apt to go on secreting its usual fluid, and a sinus remains for weeks or months. The same may be said for incision and stuffing; it may fail to cure owing to some small portion of the secreting surface escaping the pressure of the stuffing. Excision has therefore become the one recognised means of treating cysts in all cases except those in which some special indications to the contrary are present. For example, an universally adherent ovarian cyst may have to be opened and drained, a thyroid cyst is opened and stuffed, in each case because of the impracticable or highly dangerous character of the operation of excision.

"We have all experienced the tedious repair of simple periosteal dental cysts when opened and drained or stuffed; such cavities often go on discharging for many weeks or months. This is due not only to their secreting lining membrane, but to the unyielding nature of their walls, and in many cases, also, of the tissues surrounding them. I can see no reason why such cysts should not be excised, and I would record an instance in which I pursued this treatment with marked benefit to the patient.

"Miss E. F., aged 40, came to me in March last at Middlesex Hospital, on account of a swelling in the cheek. This had been first noticed about twenty months previously, when it seemed about the size of a pea; it enlarged slowly up to July, 1891, since then it has grown rapidly. I found an ovoid, tense fluctuating swelling, the size of a pigeon's egg, filling up the right canine fossa and projecting over the alveoli of the first bicuspid and third molar. Parchment crackling of the cyst-wall was easily obtained. There was no alteration of the orbit, nose or palate. The right

upper bicuspid teeth had been lost, and the first molar was decayed level with the gum.

"On March 9th, chloroform was administered, and I first extracted the stump of the first right upper molar. This was followed by a gush from the cyst of glairy fluid, rich in cholesterine. The mucous membrane over the cyst was cut through, and with a raspatory the cyst was enucleated from the tissues in which it lay. This was by no means difficult. The cyst appeared to have bulged into and to have filled the entire antrum. There were no teeth in it.

"Four days later (March 14th) the patient left the hospital. She came up to see me a fortnight later. The cavity was then much reduced in size, and *all* external signs of it had disappeared. She paid her final visit in another two weeks, when I found the cavity almost obliterated—it was no larger than a pea. Here, then, was a large cyst, as big as a hen's egg, cured by a trifling operation in three weeks. I am aware that this case illustrates but a small practical point, but any measure that shortens our patient's convalescence, even from simple troubles, is of value and of importance. I shall certainly continue to practise this operation rather than that of incision and drainage or stuffing, and, if occasion arises, employ it also in the more important class of dentigerous cysts."

Mr. Paterson desired to know whether the bicuspid teeth mentioned by Mr. Gould as absent, had ever been erupted, or if not, whether they were subsequently found by the operation to be in the cyst, or in connection with it? He (Mr. Paterson) had recently treated dental cysts, as apart from dentigerous cysts, and not involving the antrum, by packing with strips of lint, or washed tape soaked in a very strong solution of chromic acid. The drug set up violent inflammation of the cyst wall, followed by free suppuration, and in two cases the lining of the cyst sloughed and was drawn out by tweezers. The cure was, he found, speedier by this method. He remarked that the drug was a powerful one, and care and attention were necessary in using it. He pointed out that strips of

lint for packing purposes had a tendency to fray out and tear into fragments, especially if retained for any length of time, and instanced two cases of long continuance of discharging dental cysts by reason of this, and the negligence of the patients entrusted with the daily dressing of their own cases. From one he removed seven strips and portions of strips, all very foul, and from the other, five similar dressings, or parts of dressings.

Mr. Cornelius Robbins said that within the last four months he had had a case which well bore out what the writer of the last communication had stated. A patient, aged about 60, came with a large fibrous cyst in the lower canine region; he made an incision and packed it with carbolized lint. He saw the patient the next day, but not liking the appearance of the case sent her to Mr. Christopher Heath, who removed the cyst and the opening healed very rapidly. Mr. Robbins had since made a set of teeth for the patient.

Mr. E. Lloyd Williams thought that unless Mr. Pearce Gould assured them that the cyst contained one or more teeth, it was properly an ordinary dental cyst, and not a dentigerous cyst.

Mr. William Hern had treated several of these periosteal cysts illustrating the uselessness of tapping. In most of the cases which had come under his care he had enlarged the cyst, stuffed it with lint, and allowed it to granulate up.

Mr. Pearce Gould, in reply, said that he did not intend to convey that the bicuspids had not been erupted; he thought they had been removed. Mr. Lloyd Williams was quite correct in describing the cyst as a dental cyst, but he (Mr. Gould) could not quite agree with him as to the simplicity of treatment.

Mr. S. J. Hutchinson said that he did not propose to take up the time of the Society, but at a previous meeting, when the discussion on the anterior protrusion of the upper teeth took place, Mr. Woodhouse alluded to uni-

lateral protrusion in adult patients. He (Mr. Hutchinson) had an exceptionally good model of such a case, and he thought that it would be of some interest. It was an exceedingly typical case. The patient was 36 years of age, and she had not noticed the protrusion of this tooth until within the last six or twelve months. He would not attempt to explain it on this occasion, but would ask the Curator to place it in the Museum as a very good case.

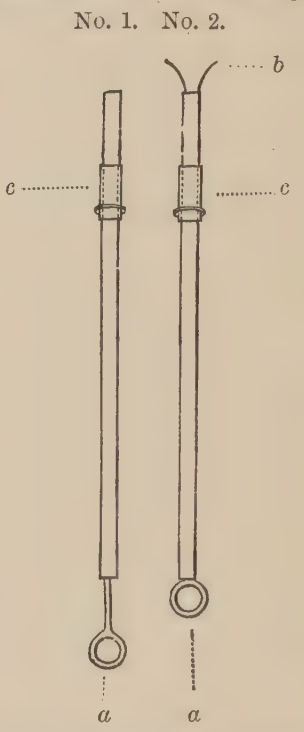
Mr. J. Smith Turner said that he had been put down on the agenda paper to call attention to the teeth of the Guanches. The Guanches, as they would probably be aware, were the ancient inhabitants of the Canary Islands, off the coast of Africa. They were pretty well exterminated by their conquerors, the Spaniards, in 1474, so that the lower maxillæ which he had to show them might be reckoned to date before that period. The teeth of these Guanches were not likely to get mixed up with the teeth of their conquerors, as they were in the habit of stowing away their dead in caves. He was indebted to Dr. Chill, of Las Palmas, for the specimens. It appeared that the "teeth harriers" had been there long before the scientist, as the incisors and bicuspids were all gone. It was the custom of dentists in early days to cut up human teeth to supply the wants of their patients—artificial teeth being unknown or too inferior to be generally used—and the battle-fields of Europe were ransacked for this purpose. His object was to call attention to these teeth. They would notice that the masticating surfaces were all ground very smooth; all the teeth of those who had lived to any age had that characteristic. They were worn away just as the ancient Britons' were worn, because they ground their corn in stone mortars, and these mortars were very friable, being composed mainly of pumice stone. Another point with reference to the teeth was, that there were sundry marks of decay and traces of alveolar abscesses and caries, showing that these people had evidently enjoyed the luxury of toothache without having the advantage of dental care. He had also the skull of a mummy, the teeth of which were

very perfect; the lower wisdom teeth had a transverse position, and were growing into the twelve-year-old molars. Mr. Turner observed a large cavity in each twelve-year-old molar, immediately opposite the crown of the wisdom tooth. He thought it a very good example of a well-worn and well-developed lower maxilla. Mr. Turner, while in the Canary Islands, picked up about 260 teeth which had dropped out of the skulls, of which a large number were more or less decayed. He had also a specimen of a gemmated central and lateral incisor. He only saw a very few skulls of children, and in none of them did he find any decayed teeth.

The PRESIDENT asked if Mr. Turner could say upon what these people had fed?

Mr. SMITH TURNER replied that they were chiefly vegetarians.

Mr. DAVID HEPBURN described an instrument for gauging the length of the canal in antral cases. Mr. David Hepburn said that after creating an opening into the antral cavity through the socket of a tooth, it was frequently necessary to insert a drainage tube attached to a plate, and in order that the tube might act it was essential that it should be of the proper length. He had experienced great difficulty in ascertaining, with ordinary probes or excavators, the relative position of the floor of the antrum with regard to the external opening of the canal, and had, therefore, devised an instrument with which the position of the parts could be ascertained with rapidity, certainty and absence of pain or inconvenience to the patient. The illustrations would sufficiently explain the nature of the instrument. No. 1 shows the instrument as it may be inserted into the antrum. When fairly in the cavity



handle (*a*) is pressed, when two horns (*b*) emerge; these act as grappling hooks, but can in no way injure the tissues, being made of watch-spring. By means of the hooks the floor of the antrum can be distinctly felt. A movable gauge (*c*) is then adjusted to show the position of the external opening, and the horns being drawn in by pulling the handle (*a*), the instrument may be removed. The distance marked by the dotted lines gives the exact length of the canal.

Mr. F. Canton exhibited the model of a boy's mouth, showing the left central abnormally large. It was not in his opinion a case of gemmation, as the lateral was distinctly visible behind it.

Dr. Röder (of Budapest) presented an elevator of his invention specially intended for extracting teeth of wisdom with the crowns broken off—an operation either altogether impossible by means of the instruments hitherto in existence, or accompanied by excruciating pain. He used the same instrument with advantage in a variety of other difficult cases, as well as for extracting even the smallest fractions of stumps.

Mr. Ackery said with regard to Mr. Canton's model, that it certainly seemed to him that it might be a case of gemmation with a supernumerary or supplemental tooth.

Mr. F. Canton did not think that it had that appearance at all.

Dr. Hewitt then read his paper on "The Anæsthetic effects of Nitrous Oxide administered with Oxygen at ordinary Atmospheric Pressures: with remarks on 750 Cases."

On the Anæsthetic Effects of Nitrous Oxide when administered with Oxygen at ordinary Atmospheric Pressures: with Remarks on 800 Cases.

By Frederic Hewitt, M.A., M.D. Cantab.

Instructor in, and Lecturer on, Anæsthetics at the London Hospital; Joint Administrator of Anæsthetics at Charing Cross Hospital; Anæsthetist at the Dental Hospital of London and at the National Orthopædic Hospital.

A.—Preliminary Considerations.

Mr. President and Gentlemen,—When nitrous oxide, free from all oxygen, is administered to a patient by means of an accurately fitting apparatus possessing two efficient valves, so that, at each inspiration, nothing but the pure gas is breathed, and each expiration escapes into the surrounding air, certain phenomena, with which you are all familiar, make their appearance. In some cases these phenomena are very rapidly developed; whilst in others a greater tolerance of the gas is observable, and a longer inhalation is necessary for their production. Now in order that I may make my subsequent remarks clear, I must ask you to picture to yourselves an average patient fully under the influence of nitrous oxide administered as above described; and to briefly consider with me the chief symptoms displayed by such a

patient during the two or three seconds immediately preceding the removal of the face-piece for the performance of a dental operation. I am fully aware that different administrators carry the inhalation of nitrous oxide to somewhat different points. I do not ask you, however, to picture to yourselves a patient who has received an unnecessarily large dose of the gas, but one to whom the usual quantity has been given.

It is taught by our leading anæsthetists, and I venture to agree with them, that for dental operations, nitrous oxide should be administered till the so-called "stertor" is produced, or till some twitching in the extremities is observed. Now, in examining the phenomena of a patient at the juncture to which I have alluded, we shall, in the first place, be struck by the peculiarity of his respiration. During the earlier stages of the inhalation the breathing, although deeper and quicker than normal, will have been performed regularly, and in most cases without snoring or other sounds. But it will now be noticed to be irregular, jerky, or even tumultuous, and to possess a characteristic and irregular sound of a guttural or of a snorting character. The irregularity in the respiratory movements, has, I believe, as its immediate cause one or other of two conditions. It is either due to spasmodic elevations and depressions of the larynx, so that the superior

aperture of this organ comes at short intervals into contact with the epiglottis and base of the tongue, or to irregular spasm of thoracic and abdominal muscles. The guttural sound, which indicates that the full effects of the gas have been produced, is doubtless due to the former of these two conditions. To this sound the term "stertor" is often applied, but as it is not a snoring sound the name is hardly appropriate. Snoring sounds may, of course, be present, in which case they are liable to mask the deeper and more characteristic guttural sound. Loud irregular snorting is sometimes met with, more especially if the gas has been pushed very freely—perhaps a trifle too freely. At the acme of the respiratory changes alluded to the pulse will be found to be considerably increased in rate. Although it is frequently taught that slowing of cardiac rate occurs during gas administration, experience leads me to an opposite view. I find that it is more common for the initial acceleration (from mental excitement) to persist and in many cases to increase, and that slowing of the pulse rate does not occur till air is admitted, when an abrupt fall in rate is almost invariably to be detected. At or about the same moment at which these respiratory and circulatory phenomena appear, it will usually be noticed that the patient exhibits evidences of irregular clonic muscular spasm in the peripheral parts

of the body. To these clonic muscular twitchings the term "jactitation" is often applied. The face, the fingers, the arms, the legs, and even the trunk itself may share in the clonus. Micturition not infrequently occurs, more especially in children, during these jerky movements. Children are particularly prone to exhibit the muscular phenomena here referred to; and, as every dental surgeon will know, such movements may occasionally interfere with the efficient performance of the operation. Clonic movements are often followed or accompanied by tonic, and a state of opisthotonos may be induced. Although anæmic patients, like children, are very susceptible to the action of nitrous oxide, and quickly exhibit the respiratory and muscular phenomena described, florid and vigorous persons may unexpectedly, though rarely, prove equally susceptible subjects. I shall have occasion to refer to a healthy and florid female patient, who, after from twelve to fifteen breaths of nitrous oxide, immediately exhibits the so-called "stertor" and "jactitation" in a very marked and inconvenient degree. In addition to the respiratory and muscular symptoms which follow the free use of undiluted nitrous oxide, there is always some change in the natural colour, and the features assume a dusky, livid, or even a cyanotic aspect. The altered colour is always most noticeable in

ruddy faced or plethoric patients, and is greatest at the acme of the administration, *i.e.*, at the juncture we are considering, and when respiratory rhythm is most interfered with. Those patients who are very susceptible to nitrous oxide and quickly display jerky respiration and muscular movement will also quickly display lividity, the intensity varying with the previous colour. Dilatation of the pupils is nearly always present when a full dose of nitrous oxide has been administered, the degree of dilatation varying in different cases. A maximum dilatation is very common at the height of the changes in respiration already described. Lastly, the tongue and adjacent mucous membranes become dark, engorged, and swollen, when the administration of the gas is carried to the point which has been indicated.

Nitrous oxide has proved such an excellent anæsthetic in dental surgery that it seems almost ungracious to draw attention to the few and comparatively unimportant disadvantages which are connected with its employment. Its great safety, its rapidity of action, and its remarkable freedom from after effects, all combine to render it superior to other anæsthetics for brief operations. But like every other therapeutic agent it has its drawbacks; and it is with the object of lessening or removing these that the admixture of oxygen with nitrous oxide has been suggested. If we can

obtain nitrous oxide anæsthesia without the occurrence of "stertor," "jactitation," and lividity, so much the better. Now, without entering at length into any physiological details I may say, and I think without fear of contradiction, that by the addition of a comparatively small proportion of oxygen to nitrous oxide the three symptoms mentioned may be more or less completely prevented without interfering with the anæsthetic effects of the nitrous oxide. I am aware that this Society has lately had before it a very able and thoughtful paper from Dr. Dudley Buxton, in which he has attempted to show that nitrous oxide administered in a proper manner produces no asphyxial phenomena—that the latter only supervene when the agent is unduly pressed. I will not therefore reopen any discussion on this point. All I state is this, that the three phenomena referred to—which are, to a greater or less degree, essential to success in ordinary nitrous oxide administration in dental practice—do not appear when oxygen is used with nitrous oxide. And let me remind the Society that these three symptoms do appear and in a very marked degree when pure nitrogen is inhaled. At the instigation of Sir George Johnson, Mr. Braine and I administered nitrogen, not only practically free from oxygen but with known and small percentages of this gas, to several patients at the Dental Hospital of London; and the phe-

nomena were to the by-standers indistinguishable from those of an ordinary nitrous oxide administration. No one can, I think, deny that the "stertor," "jactitation," and lividity produced by nitrogen are of asphyxial origin. The interesting and significant results which we obtained have already been published in the medical journals.

Ordinary atmospheric air, when mixed in sufficient proportion with nitrous oxide, will prevent the three phenomena under consideration, but is not nearly so suitable as oxygen itself for this purpose. In nitrous oxide mixed with air, we have to consider two factors: (1) the anæsthetic, and (2) the oxygenating factor. In the case of patients requiring large doses of nitrous oxide, it is not possible to have the oxygenating factor present to any great extent, otherwise intoxication rather than quiet anæsthesia results. But in weakly and fragile subjects the oxygenating factor may be present to a greater extent, and the proportion of the nitrous oxide may still be sufficient to produce tranquil anæsthesia. I have often anæsthetised children and others with nitrous oxide and air, without producing, save perhaps in a minor degree, "stertor," "jactitation," or cyanosis. The unsuitability of atmospheric air as an oxygenating agent is due to its useless nitrogen. If we administer with nitrous oxide a percentage of air capable of preventing the three symptoms, we

shall, in most cases, also prevent deep anæsthesia, owing to the too small precentage of nitrous oxide in such a mixture. For example, a mixture of 50 per cent. of air and 50 per cent. of nitrous oxide would contain about 10 per cent. of oxygen and about 40 per cent of nitrogen; and although the 10 per cent. of oxygen might be sufficient to prevent marked cyanosis, "stertor," and clonic muscular spasm, the 50 per cent. of nitrous oxide would probably be insufficient to produce tranquil anæsthesia. If, however, instead of using air for oxygenating purposes we employ oxygen, we shall be able to replace the 40 per cent. of useless nitrogen by a corresponding quantity of useful nitrous oxide; and the proportion of the latter will now rise to 90 per cent. With such a large percentage of nitrous oxide anæsthesia is almost certain to become established, and the percentage of oxygen remaining the same as in the nitrous oxide and air mixture, "stertor," "jactitation," and other evidences of extremely deficient blood oxygenation will be prevented.

Perfectly pure nitrous oxide, administered as described at the commencement of this paper, is only respirable for a very brief space of time. When the phenomena to which I have referred make their appearance the inhalation must be discontinued, and oxygen, in some way or another, admitted to the lungs. It is this want of

available oxygen which makes pure nitrous oxide an irrespirable gas, save for a very short period. Should the administration be persisted in respiration would come to a standstill, and the standstill, in most cases, would have as its immediate cause spasm rather than paralysis of muscles directly or indirectly concerned in the performance of respiration. When nitrous oxide is administered in such a manner that the air originally present in the lungs is not removed as rapidly as has been indicated (as for example, when a facepiece with but one valve is employed, or a so-called supplemental bag is used), a longer time is taken for the production of the respiratory changes described. A similar increase in the period of inhalation may be secured by allowing a small percentage of air to become admixed with the gas. Too much air would of course reduce the anæsthetic properties to a minimum, and give rise to intoxicating but not anæsthetic effects. But the best plan to render nitrous oxide respirable is to administer it with oxygen, as will be presently described.

In administering anæsthetics for dental operations, one is frequently struck by the fact that the available period of anæsthesia, after removing the agent employed, is, to a great extent, dependent upon the length of inhalation. Now, as we have seen, this period of inhalation is, in

the case of undiluted nitrous oxide, often very short; and the resulting anæsthesia is often correspondingly transient. I am well aware that exceptional cases occur, and that by administering the gas in such a way that a short period of re-breathing is allowed towards the close of the administration, a longer anæsthesia than usual may be produced. But by the use of oxygen with nitrous oxide we present the anæsthetic to the patient in a respirable form. Large volumes of the gas can thus be thrown into the patient's circulation—far larger quantities than one can administer in the absence of oxygen—and thus the resulting period of anæsthesia becomes appreciably prolonged. It may be said indeed, but more especially with regard to exceptional cases, that nitrous oxide does not have a fair chance, when administered in the absence of oxygen, of producing its anæsthetic effects; for at or about the moment of commencing true anæsthesia, symptoms dependent upon oxygen-starvation assert themselves, and the inhalation has to be stopped.

There is yet another important advantage in the employment of oxygen with nitrous oxide. Although the use of the latter gas, administered in the ordinary manner, is, as you well know, practically free from risk to life, every one who has had a large experience with it must have met with exceptional cases in which threatening

symptoms have arisen. Without entering more fully into this part of the subject, there is every reason to believe that when such symptoms do arise, they are dependent upon the want of oxygen. Obstructed, shallow, or arrested breathing, cardiac depression, &c., will be far less likely to occur when oxygen is used with nitrous oxide.

B.—Earlier attempts to produce satisfactory Anæsthesia from Nitrous Oxide in the presence of Oxygen.

The late Paul Bert was the first to attempt to secure tranquil anæsthesia from nitrous oxide in the presence of oxygen. After numerous experiments, he arrived at the conclusion that an increase in the ordinary atmospheric pressure was necessary in order to obtain good results. He regarded nitrous oxide as an agent which, at normal pressures, could only produce anæsthesia when administered by itself, that is, free from all other gases. He therefore contended that, in order to obtain the anæsthetic effects of nitrous oxide in the presence of oxygen, it was necessary to administer the mixed gases under an increased pressure, in order that the blood might take up more of the nitrous oxide than would be possible in any such mixture administered at ordinary

pressures. Specially constructed chambers, in which the atmospheric pressure could be raised, were made. Time will not permit me to describe them or the details of Bert's ingenious and successful process. The results, so far as the anæsthesia was concerned, were in the highest degree satisfactory. Not only was there an absence of all asphyxial phenomena, but the addition of the oxygen rendered the nitrous oxide so respirable that a continuous administration was possible, and surgical operations of considerable duration and magnitude were performed. But owing to the costliness of the apparatus, to its being cumbrous and somewhat complicated, and to the discomfort experienced by the operator and his assistants by reason of the increased pressure to which they were necessarily subjected, Bert's chamber is now very rarely employed.

Bert's results were so remarkable that attempts were subsequently made to secure equally satisfactory effects without the employment of the increased atmospheric pressure which Bert had regarded as essential. Klikowitch appears to have been the first to succeed in this direction; Zweifel soon followed; and Hillischer has lately recorded a large number of cases to which I shall subsequently allude. The last-named observer has given the name "Schlafgas" (sleep-gas) to

the mixture, in consequence of the sleep-like condition which it produces.

C.—An account of 805 Administrations of Nitrous Oxide and Oxygen conducted at ordinary atmospheric pressures.

In 1886, having been informed by Mr. Cunningham of the attempts which were being made in Germany to obtain satisfactory anæsthesia from nitrous oxide and oxygen, without employing an increased pressure, I commenced a series of experimental administrations. Up to the time at which I am writing (June 6th, 1892), I have administered oxygen with nitrous oxide in 805 cases, and with your permission I will relate, as briefly as I can, the various plans which I have tried and the results which I have obtained.

Series 1 (21 *Cases*).

The so-called "supplemental-bag" of an ordinary nitrous oxide apparatus was filled with 20 per cent. of oxygen and 80 per cent. of nitrous oxide. When the full effects of nitrous oxide had been induced, the tap of the "supplemental-bag" was turned and the oxygen mixture was respired. The tumultuous respiration, "stertor," and "jactitation," of nitrous oxide quickly subsided as this was done. The results, however, were not satisfactory.

Series 2 (7 *Cases*).

A small bag filled with oxygen was interposed between the face-piece and the nitrous oxide bag, and by means of a three-way regulating tap I was enabled to divert any desired proportion of the inspired nitrous oxide current through the oxygen bag on its way to the patient. The results, however, were equally unsatisfactory.

Series 3 (16 *Cases*).

Nitrous oxide and oxygen were mixed in varying proportions in an ordinary gasometer, and a chemical analysis was made of the mixture which answered best. The analysis showed a percentage of 12.77 of oxygen.

Series 4 (121 *Cases*).

A mixture containing 12½ per cent. of oxygen with nitrous oxide was administered from an ordinary gasometer. In all these cases the natural colour was preserved, the so-called "stertor" and "jactitation" were completely absent, and the mixture could be respired continuously without difficulty. Good and tranquil anæsthesia occurred in most cases, but in a certain number an undesirable degree of excited movement, screaming, &c., were met with rather early in the administration; so that the percentage of nitrous oxide in the gasometer had to

be quickly increased. In two or three cases I completely failed to secure quiet anæsthesia. The average period of inhalation was 126 seconds; the average available anæsthesia was 44 seconds; and the average quantity of the mixture used was $8\frac{3}{4}$ gallons.

Series 5 (11 *Cases*).

I now had made a regulating apparatus consisting of a mixing cylinder supplied from two bags. The cylinder had a dial and indicator, and the orifices leading from the bags could be opened to any desired extent. The apparatus, however, did not work well, and the results were not good.

Series 6 (13 *Cases*).

I next tried two india-rubber bags, one for nitrous oxide, the other for oxygen, and made according to accurate measurements to contain, when full, the two gases in the proportion which I now believed would answer best, viz., that of 90 per cent. of nitrous oxide and 10 per cent. of oxygen. The bags were filled with their respective gases, the stop-cock connecting them was opened, the oxygen thrown into the nitrous oxide, and the mixture was then administered. I found that this plan answered well if pressure was exerted upon the bags during the administration, but not otherwise.

Series 7 (14 *Cases*).

I therefore next devised an oblong dry gasometer, and weighted it during the administration. It had mackintosh sides, and measuring rods at each end. It was not successful, as it did not work freely.

Series 8 (131 *Cases*).

I therefore next tried a circular dry gasometer, with a central vertical measuring and steadying rod, and weights as before, and found that it answered very well. With this apparatus one could easily prepare the proportion of oxygen required. It had an arrangement by which the percentage of nitrous oxide in the gasometer could be increased, or, if deemed advisable, nitrous oxide *per se* could at any moment be administered instead of the mixture. I was gradually finding out the fact that patients varied considerably in the percentage of oxygen which was requisite. The large majority of these cases were successful, but in several I had to have recourse to pure nitrous oxide.

Series 9 (29 *Cases*).

Wishing to find an explanation of the much better effects which were obtained when the mixed gases were administered from a distended bag, and thinking that such effects might possibly

be due to the mixture of the gases being forced, as it were, into the pulmonary passages, I next made a series of experiments, in which I controlled the free action of the expiratory valve by weighting it, thus decreasing the freedom of expiration. The results were, however, of a negative character.

Series 10 (67 *Cases*).

I next had made a wedge-shaped reservoir to rest upon the ground, and capable of holding about twelve gallons. A long wide tube led from the thin end of the wedge-shaped reservoir to the bag and face-piece. The inhaling bag was one-tenth the capacity of the reservoir, so that it was first filled with oxygen and then nitrous oxide added till the whole apparatus was charged. The foot of the administrator kept up slight pressure upon the reservoir during the administration. I still found 10 per cent. of oxygen gave good results; it answered in nearly every case. When I met with a patient in whom this proportion of oxygen proved too high, it was easy to add more nitrous oxide; and so every case could be terminated successfully.

Series 11 (88 *Cases*).

Still aiming at greater portability, I next had constructed for me a regulating apparatus, somewhat similar to that which I had tried some years

previously. Two india rubber bags were kept supplied with the two gases, and the tubes leading from the bags joined at a regulating tap and dial, so that, as one tube was more or less opened the other was more or less closed. I found I had to employ as many as four flap valves in this apparatus in order to make it efficient. There was a difficulty, however, in admitting the oxygen in very small quantities at a time. There is precisely this objection to the apparatus used by Dr. Hillischer. The oxygen inlet does not admit of fine enough sub-division—in other words, by a very slight movement of the indicator too great an increase or decrease in oxygen is effected.

Series 12 (125 *Cases*).

I overcame the difficulty last mentioned, to a great extent, by making the oxygen come up through small holes, any number of which could be opened or closed at a time. Of the 125 administrations thus conducted 119 were in dental practice. An analysis of these 119 gives the following results:—

(1) *Sex:* 84 females, 32 males, 3 not stated.

(2) *Age:* oldest patient 59 years, youngest 13 years.

(3) With regard to the *general result.* Deducting 4 cases of which the notes are imperfect, 115 cases remain; of these 79 (or 68.7 per cent.)

are described as typical, *i.e.*, they displayed good colour, no "jactitation" or "stertor," more or less complete muscular relaxation and quietude during operation.

(4) Of the 36 atypical cases, 9 were typical except for duskiness; 6 were typical except for rigidity; 7 were very good, but in some respect or another not quite typical; 1 was typical except for some excitement; 6 were only moderately successful; and 7 were terminated with symptoms of ordinary nitrous-oxide narcosis.

(5) *Period of inhalation.*—This was taken accurately by the métronome in 46 cases. The average was 116.2 seconds.

(6) *Available period of resulting anæsthesia.*—This was taken in 45 cases by the métronome. The average worked out at 42.6 seconds.

From the above analysis it is clear that the results were not as satisfactory as could be wished, for although no failure to produce unconsciousness to pain occurred, several cases were only partially successful so far as a quiet anæsthesia was concerned, and in as many as seven instances the administration was terminated by means of pure nitrous oxide. In many of the earlier administrations with this apparatus I gave a certain number of breaths of the pure gas and then admitted oxygen in increasing quantities. I subsequently found, however, that this plan was

not nearly so satisfactory as that adopted later, viz., commencing with a small percentage of oxygen and gradually increasing it. I also found that although this apparatus answered much better than all its predecessors, it yet allowed rather too much oxygen to come through as each hole was turned on. By a series of experiments I found, for example, that when five holes were open, as much as 13 per cent. of oxygen was breathed.

Series 13 (162 *Cases*).

The apparatus* used in this, the last series, differs only from that just described in that its oxygen holes are about one-half the size. This slight alteration has proved a very important one. The accompanying drawings show the apparatus with which the cases have been conducted.

Two india-rubber bags are employed: one for nitrous oxide, the other for oxygen (fig. 1, ON_2 and O). These, which are fed from cylinders worked by the foot, are attached to two metal tubes T′ and T. Where the tubes join there is an arrangement by which oxygen may be added to the current of nitrous oxide to the desired extent. Above this regulating arrangement with

* Messrs. Barth &. Co., of Poland St., Oxford St., who have most patiently constructed various forms of apparatus for me, are the sole makers of that which I now use.

its dial (D), indicating handle (H), and indicator (i), there is a two-way stop-cock, which allows, by the movement of its handle (H′) either of air or of the mixed gases being breathed. In order

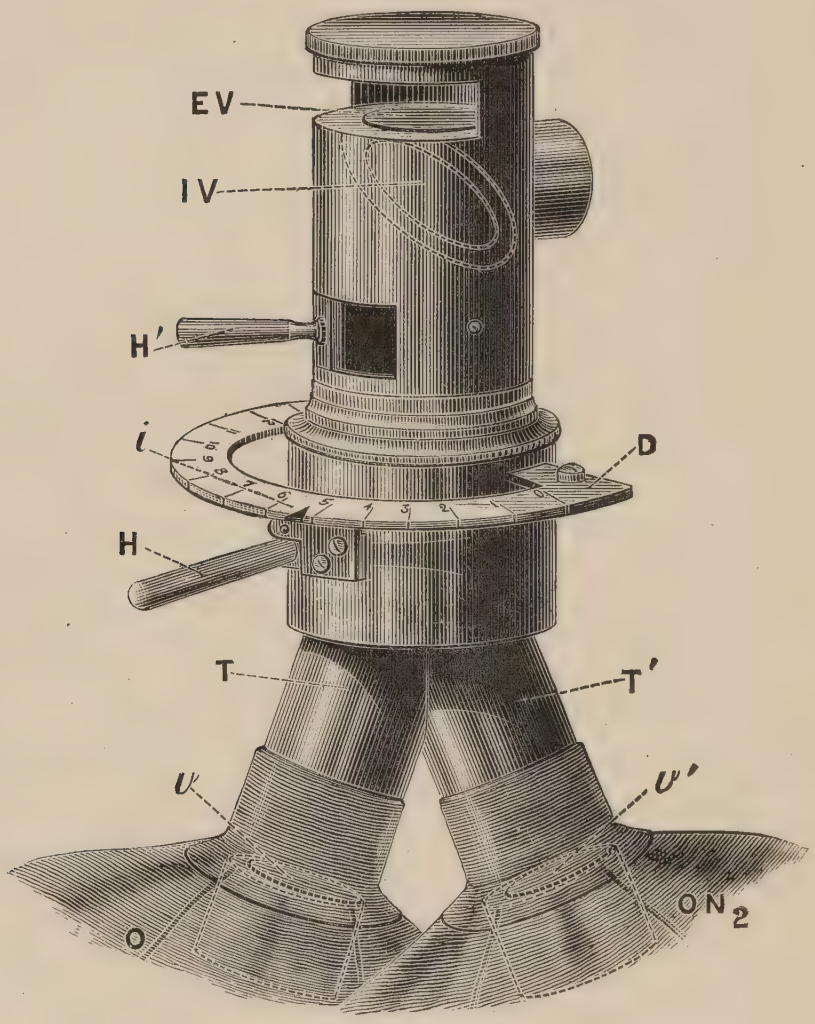


Fig 1.

to permit the free escape of each expiration, two flap-valves, one an expiratory (EV), and one an inspiratory (IV) are provided. The tubes (T and T′) also possess flap-valves (v and v′)

to prevent the contents of one bag passing over to the other. The oxygen tube T is considerably expanded above, so that the nitrous oxide tube may pass up through its middle. Oxygen thus travels along the circular channel left between the tubes, whilst nitrous oxide passes along

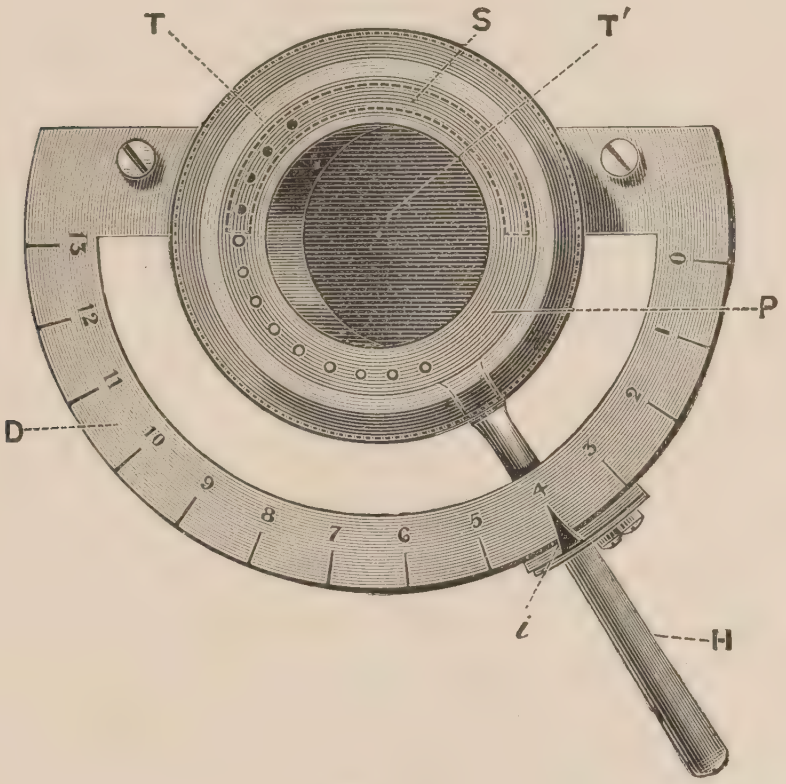


Fig. 2.

the inner tube. Fig. 2 shows the central nitrous oxide tube (T′) and the expanded oxygen tube T. The space left between the nitrous oxide tube and the expanded oxygen tube is closed in by two circular plates, the upper of which (P) revolves by means of the handle (H) upon the

lower, which is fixed. The upper plate has 13 holes in it. The lower has a long slot (S) shown in dotted lines. Now when the handle (H) is turned, so that (P) revolves, one or more holes can be brought over the slot in the lower plate, and be thus rendered available for the passage of oxygen. In Fig. 2 the indicator points to "4" on the dial: *i.e.*, four holes are opened for oxygen and nine are closed. *By this plan a very small increment or decrement in oxygen is represented by a very considerable excursion of the indicator along the dial plate.* Notwithstanding that I have made a large number of experiments with the object of ascertaining what percentages of oxygen pass through these holes, I find it impossible to give any reliable averages, owing to the variations in pressure which must to some extent occur in the bags during the administration. All that I can say is that when both bags are kept partially distended and one hole is open, a very small percentage (something between $3\frac{1}{2}$ and $6\frac{1}{2}$ per cent.) of oxygen will come through, and that each additional hole turned on represents something like an additional 1 per cent. or $1\frac{1}{2}$ per cent. of oxygen. In actual practice all we require is an apparatus which will allow of very small increments and decrements of oxygen. Should one bag ever be allowed to become fully distended the regulating apparatus will, of course, fail to

work as such. If one bag be allowed to become more distended than the other the percentage of its gas will, of course, be higher than when the bags are of equal size. The apparatus here de-

Fig. 3.

scribed allows (1) air, (2) nitrous oxide, or (3) nitrous oxide mixed with a proportion of oxygen, to be freely respired through valves at the will of the administrator.

When ready for use the apparatus has the appearance represented in fig. 3.

Before commencing the administration the anæsthetist should make sure that he has a sufficient supply of the two gases in the cylinders. In the next place, it is important not to charge the bags till immediately before the inhalation. The face-piece should be one which is capable of being applied to the face with the utmost accuracy, as a want of co-aptation which, in the case of nitrous oxide alone would not be detrimental, would, in the case of the mixture, be likely to lead to partial or complete failure. The valves of the apparatus should work efficiently and freely. After passing a small quantity of the gases through the bags, in order to free them from all traces of air, the anæsthetist should turn off the two-way stop-cock, and place the oxygen indicator at "0." Both bags should now be filled to about one-half with their respective gases, and the face-piece applied. Air will now be breathed freely through the apparatus, and the sound of the acting valves will prove that the face-piece fits well. The patient should be instructed to breathe freely and moderately deeply, "in and out through the mouth." This is important, for as he commences to breathe, so he will probably continue when the mixture is admitted. When the administrator sees and hears

that breathing is free, and not till then, he should fix the oxygen indicator at "2" and turn on the mixture at the two-way stop-cock. Nitrous oxide with a small percentage of oxygen will now be breathed. After a few seconds the oxygen indicator may be turned to "3," and in a few seconds more to "4." In children, anæmic subjects, and debilitated persons, the indicator may be moved to "3" and "4" more quickly than in strongly-built or alcoholic individuals. During these manipulations the two bags must be kept as nearly as possible equal in size. It is rarely, if ever, necessary to replenish the oxygen bag during the administration, but the foot must be constantly kept on the nitrous oxide key. Considerable practice is necessary to keep both bags equal in size throughout. Should phonation, laughter, excited movement, or struggling assert itself, the administrator should withhold more oxygen for the present, or even give less of this gas, by turning back the indicator for a few breaths. In forty or fifty seconds from the commencement of the inhalation the indicator may usually be got as far as "5," and in twenty seconds or so more may be allowed to point to "6," "7," or even "8." Generally speaking, it is not advisable to give more oxygen than this. The administrator must judge from the symptoms of the patient the extent to which oxygen should be

given. It is impossible to formulate any definite rules as to the extent to which this gas should be admitted. Considerable practice is necessary, not only to get the face-piece to fit with extreme accuracy and to keep the bags *half distended*, but to know when to give more, and when to give less oxygen. The analysis of my last 153 dental administrations, together with a careful study of the five illustrative cases in the table, will, perhaps, be of service in this connection. Whilst too much oxygen will be likely to induce laughter, excited movement, stamping, screaming, &c., and whilst it is right, should such symptoms appear, to give less oxygen, the anæsthetist must be careful not to proceed too far in the opposite direction. In regulating the increase or decrease of oxygen we must reckon what the *future* effects of any procedure will be. For example, if some phonation occurs we should give somewhat less oxygen for a short period, but not necessarily till the phonation has ceased. We may usually turn back to the previous proportion of oxygen *before the symptoms of excitement have actually subsided*, knowing that they will subside in obedience to the lessened proportion of oxygen admitted several seconds previously.

Of the 162 administrations which I have conducted with the last-mentioned apparatus, 153 have been in dental practice. By the kindness

of Dr. Cockburn Smith, Mr. George Rowell, and numerous house surgeons and students—to all of whom I now beg to express my very great indebtedness—I have been able to obtain good notes of most of these 153 cases. Whenever time and opportunity permitted I adopted a plan which was suggested by my friend the late Dr. C. E. Sheppard, whose loss we must all so deeply deplore. A métronome was used and was set to ring its bell every third second. One assistant counted aloud at each bell, whilst another took notes on ruled forms at my dictation. From the five illustrative cases which will be given later on, it will be seen that I was thus enabled to obtain records of the effects produced by variations in the proportions of oxygen and nitrous oxide.

An analysis of the 153 dental cases of this series gives the following results :—

(1) *Sex.*—123 females; 29 males; 1 not stated.

(2) *Age.*—Oldest patient, 61 years; youngest 7 years.

(3) *Typical cases, i.e., cases with good colour, no "jactitation" or "stertor," more or less complete muscular relaxation, and quietude during operation.* These numbered 117, *i.e.*, 76.4 per cent. of the total number.

(4) Of the 36 *atypical cases*, 20 showed variable degrees of lividity but were otherwise typical; 10 were rigid but otherwise typical; 1 showed lividity

with rigidity ; 1 lividity with very slight clonus ; in 2 cases the ordinary symptoms of nitrous oxide were accidentally allowed to appear ; and 2 cases were intentionally terminated by nitrous oxide free from oxygen.

(5) With regard to the *signs of readiness for operation :* deducting the 4 cases which were terminated by nitrous oxide itself, and 12 cases in which the notes on this point are imperfect, we are left with 137 cases for examination. Of these 137 cases in which notes were taken as to signs of readiness, it is stated in 104 that the conjunctival reflex was absent. In 9 cases this reflex was not abolished, but there was either softly snoring breathing, or muscular relaxation to testify to good anæthesia being present. In the remaining 24 the conjunctival reflex was not noted, but other signs were relied upon. Of these 24 cases 4 displayed widespread muscular rigidity with an increasing, though not inconvenient, tendency for the head to come forwards or to the side ; the administration being discontinued at this point, a good anæsthesia always followed. In 19 the character of the respiration, or the relaxation of muscular system afforded good indication of proper anæsthesia. In one case only was there a slight tendency to "jactitation," and in this the patient was known to be peculiarly susceptible to nitrous oxide itself.

(6) *Phonation* was noted in 29 of the 153 cases, but it was usually not excessive. In 8 cases it occurred during the administration only; in 8 during extraction only; in 6 after extraction only; in 4 throughout the administration, extraction and afterwards; in 2 during the administration and extraction; in 1 during extraction and afterwards. Violent screaming was met with in 2 of these cases only.

(7) *Muscular excitement, struggling or kicking* were observed 8 times only. (Rigidity is not reckoned.) In 5 cases slight movements in the chair were stopped by giving less oxygen; in 1 case kicking occurred during extraction; in 1 there were movements of legs during and after the administration, the former being easily controlled by more nitrous oxide; and in 1 resisting movements were made early in the administration, but soon subsided.

(8) With regard to *the 4 cases terminated by nitrous oxide itself.* In two of these too much oxygen was given to start with, and this error could only be corrected by a rapid increase of nitrous oxide. In one of the other two, nitrous oxide came in with an unexpected rush from its cylinder. In the other I had allowed the oxygen bag to become too full, so that more oxygen than was expected came through the holes; and evidences of excitement coming on I at once finished successfully with nitrous oxide.

(9) *Period of Inhalation.*—This was taken accurately by the métronome in 67 cases, and works out as 110.5 seconds on the average. The longest inhalation was 186, the shortest, 66 seconds.

(10) *Available period of resulting anæsthesia.*—This was taken by the métronome in 69 cases. The average works out as 44 seconds. The longest anæsthesia was 90; the shortest 21 seconds.

(11) *The number of teeth or roots extracted* was recorded in 129 cases. The average works out as 2.7 per patient.

(12) *Pain.*—Patients were always questioned as to pain. With the exception of 3 cases, every patient denied the slightest pain. In one of the 3 cases, however, it is questionable whether any was really felt. Of the remaining 2 cases, in one of them (No. 735) the patient certainly felt the last tooth, but the operation lasted 66 seconds, so that in the preparation of the averages I have entered 60 seconds anæsthesia instead of 66. In case No. 794 the anæsthesia was very perfect, but was of insufficient duration for the extraction of a very difficult wisdom tooth. Although no pain was felt in Case 781 the patient was conscious of the removal of the last two stumps.

(13) *After effects.*—There was retching in one case, and a transient feeling of nausea without

TABLE OF FIVE ILLUSTRATIVE CASES.

Case No. 699.

A typical case.

Sex and Age.—M. 18.

Description.—Fairly nourished; good colour. A postman.

A.—*Period of inhalation.*

Secs.	Oxygen Indicator at	*Symptoms.*
0	2	
18	3	Six breaths taken.
33	4	
39	4	Deep respiration.
51	5	
72	5	Quieter breathing.
78	6	
90	6	No conjunctival reflex.
99	6	Pupils 3½mm. in diameter.
108	6	Inhalation stopped.

B.—*Available anæsthesia after removal of face-piece.*

Secs.	*Symptoms.*
3	Good colour.
9	No movement or phonation.
21	Opposite side of mouth being operated upon.
30	Operation over.
42	Anæsthesia at an end.

Teeth or stumps extracted.—4.
General result.—Typical.
Remarks.—No pain. No phonation or movement; no stertor or muscular twitching; good recovery; dreamt he was at his work.

Case No. 702.

A typical case except for slight duskiness. See remarks.

Sex and Age.—F. 33.

Description.—Spare; sallow.

A.—*Period of inhalation.*

Secs.	Oxygen Indicator at	*Symptoms.*
0	2	
12	3	
24	4	
39	5	
51	6	
57	6	Twitching of eyelids.
66	6	Conjunctival reflex not abolished.
72	7	
78	7	Restless movement in chair.
81	5	
84	3	
87	2	
93	3	Movement ceased.
96	5	
108	5	Slight conjunctival reflex.
120	5	No conjunctival reflex.
123	5	Breathing quicker and more audible.
126	5	Inhalation stopped.

B.—*Available anæsthesia after removal of face-piece.*

Secs.	*Symptoms.*
3	Distinctly dusky.
9	Very slight phonation.
12	Normal colour returned.
24	Some movement of legs.
30	Anæsthesia at an end.

Teeth or stumps extracted.—4.
General result.—Good but not typical.
Remarks.—Restless movements probably due to too much oxygen at 72 secs. Movements quite controlled by less oxygen (more N_2O); but some duskiness at end due to this diminished quantity. Otherwise typical. No "stertor" or "jactitation."

Case No. 703.

Long inhalation and long anæsthesia after.

Sex and Age.—F. 33.

Description.—Fairly well-nourished; fair complexion.

A.—*Period of inhalation.*

Secs.	Oxygen Indicator at	*Symptoms.*
0	2	
18	3	
30	4	
36	5	Quicker breathing.
54	6	
60	6	Quieter breathing.
72	6	Soft snoring.
84	6	Ditto
96	7	Distinct conjunctival reflex.
108	7	Snoring passing off. Slight rigidity of neck.
132	7	Tendency to turn head to left. Conjunctival reflex still present.
150	8	Very slight snoring.
171	8	Conjunctival reflex slight.
177	8	Some phonation.
180	8	Breathing quicker and more audible.
186	8	Inhalation stopped.

B.—*Available anæsthesia after removal of face-piece.*

Secs.	*Symptoms.*
9	Some phonation.
18	Phonation ceased, operation proceeding.
27	Slight rigidity, good colour.
48	Movement of hand towards head.
66	Extraction finished.

Teeth or stumps extracted.—4.
General result.—Very good, barely typical.
Remarks.—She slightly felt the last stump. Probably deduct 6 secs. from 66 above mentioned. Instance of long administration and long anæsthesia. A good deal of oxygen given.

Case No. 711.

The effects of the mixture in an alcoholic subject. Muscular rigidity marked.

Sex and Age.—M. 42.

Description.—A club servant. Tremulous; average height; in a low state of health; alcoholic.

A.—*Period of inhalation.*

Secs.	Oxygen Indicator at	*Symptoms.*
0	2	Breathes freely.
18	3	
30	4	
45	5	Deep breathing.
63	6	Quicker breathing.
72	5	
	4	
	3	
75	2	Very quick breathing (panting).
84	3	
87	4	Quieter breathing.
93	5	
99	5	Rigidity coming on, with tendency to turn head to right.
105	6	
111	6	Inhalation stopped.

B.—*Available anæsthesia after removal of face-piece.*

Secs.	*Symptoms.*
15	Fine tremor.
27	Muscular system rigid.
48	Anæsthesia at an end.

Teeth or stumps extracted.—1.
General result.—Very good, barely typical.
Remarks.—Panting breathing controlled by less oxygen. The rigid condition of neck muscles was taken as the guide that anæsthesia was present. There is no note of conjunctival reflex or colour of face.

Case No. 757.

Too much oxygen given intentionally for purposes of demonstration. Excitement thus produced easily controlled.

Sex and Age.—F. 37.

Description.—Healthy appearance. (Pulse 120 before prop inserted.)

A.—*Period of inhalation.*

Secs.	Oxygen Indicator at	*Symptoms.*
0	3	
6	3	Pulse 132.
18	4	
21	4	Pulse 144.
33	4	Average breathing.
36	4	Tranquil breathing.
42	5	
51	5	Very calm breathing.
54	6	
66	5	Slight evidences of approaching excitement.
69	4	
72	4	Some phonation.
78	3	Restless movement in chair, with tendency to slip forward.
81	3	Pulse 120.
84	4	
93	5	Quite quiet.
102	5	Inhalation stopped.

B.—*Available anæsthesia after removal of face-piece.*

Secs.	*Symptoms.*
3	Colour a trifle dusky.
15	No phonation.
21	Conjunctiva insensitive.
36	Anæsthesia at an end.

Teeth or stumps extracted.—1.
General result.—Very good, barely typical.
Remarks.—Started with oxygen indicator at "3" instead of "2," and turned it to "4" in 18 seconds.

retching in another. Recovery is not quite so speedy as after nitrous oxide alone.

In 69 of the 153 cases the métronome was used and very full notes taken. I therefore give in a tabular form five of these métronome cases. Each one illustrates some point or another. Those interested in the subject will thus be able to see at what intervals oxygen was turned on, as well as the effects which more or less of the gas produced.

D.—General Remarks on the Anæsthesia produced by Nitrous Oxide and Oxygen adminstered at Ordinary Atmospheric Pressures.

From the foregoing facts it will be obvious that patients vary a good deal in their behaviour under nitrous oxide in the presence of oxygen. In most cases a very satisfactory and tranquil anæsthesia, free from "stertor," "jactitation," cyanosis, and excitement, results. These may be termed typical cases (see Case No. 699 in table). Of the last 153 administrations in dental practice 117 were typical. On other occasions we meet with symptoms midway, as it were, between those of the typical cases and those of ordinary nitrous oxide cases. We may find, for example, that it is necessary to give less oxygen

than usual, and, therefore, to produce a slight degree of duskiness; or the patient may be rigid throughout and not relaxed, as in the typical cases; or a certain degree of phonation and excited movement may occur; and lastly, in very exceptional cases, we may be obliged to resort to the undiluted gas in order to finish the case satisfactorily.

The symptoms of the patient will, of course, largely depend upon the proportion of oxygen which is used; with large percentages we shall not obtain good anæsthesia, but shall meet with hilarious excitement, laughter, screaming, gesticulation, stamping, struggling, &c. With smaller percentages, such as those advocated in this paper, we shall in the vast majority of cases obtain tranquil or softly snoring breathing, a florid colour, a good though rather accelerated pulse, more or less complete muscular relaxation, an insensitive conjunctiva, and a fixed condition of the globes. With smaller percentages still, the colour of the features will be a trifle dusky, the breathing rougher and more audible, but still quite regular, the pulse more accelerated, and the pupils larger. Should the percentage of oxygen be still further reduced the colour will be dusky, the breathing irregular and jerky, the peculiar "stertor" or snorting sound already described will be heard, and muscular twitchings will be

witnessed—in other words, we shall have all the phenomena of an ordinary nitrous oxide administration. Jerky breathing and muscular twitchings are never met with except when the percentage of oxygen is small, or when this gas is wholly absent.

In order to successfully administer oxygen with nitrous oxide, considerable care, watchfulness, and attention to detail are indispensable. A great many points have to be borne in mind during the administration. No fixed percentage of oxygen will answer in all cases, and the percentage must be varied in accordance with the behaviour of the patient. I find it best to commence with a mixture containing a somewhat smaller percentage of oxygen than that which may be subsequently given. If we commence with a large proportion of this gas (10-12 per cent.) excitement will be not unlikely to arise. By starting with, say, 5 or 6 per cent., consciousness is destroyed with sufficient rapidity, and the chance of intoxicating effects is less than if a larger proportion had been allowed. The objection to giving pure nitrous oxide itself at the beginning is that it is sometimes difficult to quickly neutralise the effects thus produced without going to the other extreme, and administering too much oxygen. The accurate fitting of the face-piece is a matter of the highest importance. I once met with

unmanageable excitement from an ill-fitting face-piece, but on subsequently administering the same percentage of oxygen with an accurately adapted face-piece perfect anæsthesia resulted. In administering the mixture silence should be maintained, and the patient should be left perfectly undisturbed. I have more than once seen excitable movements initiated, even in the middle of an administration, by touching or raising the arm of a semi-anæsthetised patient. I have already referred to the importance, in using the apparatus last described, of preventing any distension of the bags. The behaviour of the patient must be watched with the greatest care, in order that we may observe and appreciate the significance of every symptom displayed. We have to pilot our patient along a narrow channel. On the one side we wish to avoid the clonic respiratory movements, &c., which prevent a free and lengthy intake of the anæsthetic; and on the other any inconvenient signs of incomplete anæsthesia. We must be sparing in our addition of oxygen in the case of those patients whose appearance suggests that they will be likely to require what we may call, for want of a better term, a strong dose of the anæsthetic. Patients who are easily affected by anæsthetics—such for example as children and debilitated persons of both sexes—may invariably be anæsthetised by nitrous oxide with a consider-

able percentage of oxygen; and as such patients are prone to "jactitation" and a short anæsthesia, the mixture has great advantages over the ordinary gas.

When I first drew attention to the advantages of this mixture of gases I was unable to definitely mention the signs of true anæsthesia. The appearance of the patient in the typical cases is such that it is difficult to believe that anæsthesia is really present. From the experience of the last two years, however, I may say that the gases should, as a rule, be administered until the conjunctival reflex has disappeared. Should this sign persist for a considerable length of time, other symptoms must be relied upon. Amongst these are complete muscular flaccidity, a fixed condition of the globes, and softly snoring breathing, such as that met with in good chloroform anæsthesia. In a few cases I have met with muscular rigidity, but the subsequent anæsthesia has been very satisfactory. When a very long anæsthesia is desired the inhalation should be kept up for some little time after the signs of narcosis have appeared; for, within reasonable limits, the longer the administration, the longer will be the resulting unconsciousness. The use of oxygen is particularly advantageous when a long anæsthesia is required; for by its presence nitrous oxide may be passed through the patient

in far larger quantities than would otherwise be practicable.

At the first application of the forceps, the patient anæsthetised by this mixture often displays slight reflex tonic movement in the chair. This however is rarely, if ever, inconvenient, and as a rule quickly subsides. Reflex phonation during operation is far less frequently met with than in the case of ordinary nitrous oxide.

In a considerable number of instances I have administered nitrous oxide *per se*, and nitrous oxide with oxygen to the same patient on different occasions. We learn a great deal from these comparison cases, and I therefore propose to briefly refer to a few of them.

On two occasions I gave nitrous oxide to a lady 29 years of age. She was very tall, thin, of nervous temperament, and of dark complexion. Though she felt no pain, she experienced each time a most distressing and horrible "nightmare." The sensations were so vivid that her mother wished she should take ether for a subsequent dental operation. Against our advice ether was given, and I administered it to very deep anæsthesia. A good deal of nausea, malaise, &c., followed. A further operation being required, the patient, although she dreaded the unpleasant dream under nitrous oxide, preferred this to the malaise of ether. Without permitting

her to suspect any difference in the administration, I gave her oxygen with the nitrous oxide, and, as before, left her quite quiet after the extraction. The first thing she said was that she had not experienced any unpleasant sensations. She was astonished, and asked for an explanation. On carefully questioning patients who have inhaled oxygen with nitrous oxide, I find it quite exceptional for any distressing dream or sensation to have been experienced. This may account for the less frequent screaming under the mixture. At the Dental Hospital we find the greatest difference in this respect. Whilst it is not at all an uncommon thing for the majority of a batch of patients to scream violently during extraction under ordinary nitrous oxide (although no pain is experienced), it is quite the exception for anything more than slight phonation to be heard during operations under the mixture. It seems as if by the use of oxygen a somewhat deeper anæsthesia is rendered possible.

I have noticed a better colour and less depression after the mixture than after nitrous oxide itself. I gave the latter gas to a boy of 15 on one occasion. He was put deeply under, and two teeth on the same side of the mouth were removed. Without saying anything as to the change of procedure, I administered oxygen

a week or two later. Good anæsthesia followed; two teeth were removed. The father of the boy and also the surgeon noticed after the operation that the boy had a better colour than he displayed on the former occasion, and the boy himself said he felt better.

But the principal advantages of the mixture are those which affect the operator. I have given the mixture rather recently to two patients with very large tonsils. To one of these, a little girl, nitrous oxide had been administered in the ordinary routine of practice at the Dental Hospital a week previously. The house surgeon reported that when the patient was well under gas she was much convulsed, her back became arched, her breathing temporarily arrested, she slipped down in the chair, and the operation was impossible. The child took the mixture well (Case 733), passed into the typical anæsthesia, and three teeth on opposite sides were removed. There was no difficulty in breathing or alteration in colour.

There can be no doubt that oxygen is specially useful in children in preventing "jactitation;" and is more especially useful in such cases as these. The tongue and adjacent parts do not appear to become nearly so swollen as with ordinary nitrous oxide—another point for the operator to bear in mind. An enlarged and swollen

tongue is often very inconvenient to the surgeon.

Furthermore, I have often given nitrous oxide and oxygen to patients who, on previous occasions, have shown such susceptibility to the pure gas that it had been found difficult to secure anything but a very short anæsthesia. Now, in such cases as these the addition of oxygen to nitrous oxide seems to me to be extremely useful. Several months ago I administered nitrous oxide in the ordinary manner to a female domestic servant, about 25 years of age, of very florid colour and good general physique. She was rather nervous, but not more so than the average patient. To my surprise I found that after about twelve breaths of the gas she displayed marked "stertor" and even more marked "jactitation." The movements were so inconvenient that the operator had to wait a few seconds for them to subside. A very short anæsthesia with screaming followed. No pain was felt. I gave her nitrous oxide again on a subsequent occasion and exactly the same symptoms occurred. On three subsequent occasions I administered oxygen with the gas, and with marked benefit. Not only was it possible to prolong the period of inhalation to almost any desired degree, but the resulting anæsthesia, though still somewhat shorter than is usual, was two or three times as long as it had been with nitrous oxide alone.

The following figures, obtained by the use of a métronome in one of these comparison cases, may be of interest. The patient was a healthy young woman of 23 (Case 541). With nitrous oxide and oxgyen she quickly passed into the typical state. Inhalation eighty-four seconds; resulting anæsthesia fifty-six seconds; two teeth extracted; no pain; no reflex movement or phonation. Subsequently I administered nitrous oxide in the usual manner. The inhalation took forty-eight seconds. Two teeth extracted. The second tooth was removed at the twentieth second after the withdrawal of the face-piece, and at this point she screamed. The anæsthesia was reckoned to be twenty-four seconds.

With regard to the use of this mixture in patients suffering from visceral or other diseases, little need be said. Of the cases in which I have myself administered oxygen with nitrous oxide, I have never seen the slightest approach to any dangerous condition, and I have taken all patients indiscriminately. I have given the mixture to a patient with advanced morbus cordis, and to one or two with pulmonary affections of a serious nature. I once anæsthetised a patient who, about a quarter of an hour previously, had fainted two or three times during the attempted extraction of a tooth without an anæsthetic. When I gave her the mixture her pulse was very small and

feeble, and her face quite blanched. She had had no stimulant in the meantime, and was placed vertically in the chair. I gave somewhat more oxygen than usual (Case 713). There was no excitement; the pulse and colour greatly improved as the inhalation proceeded; the administration lasted ninety-six seconds, and the resulting anæsthesia was of sixty-three seconds' duration. The patient's normal colour was completely restored at the termination of the operation.

I also have notes of a very feeble patient, to whom I gave gas with a small quantity of ether a few years ago. The ether was added because the circulation was so depressed. The operation was successfully performed, and without any pain, but the pulse was so weak afterwards that the patient had to be placed on a sofa for some time. Subsequently I anæsthetised her with nitrous oxide and oxygen, and the circulation—not only during the administration, but afterwards— never showed the slightest sign of flagging (Case 408).

Though I have not administered the mixture to any very old patients, I feel convinced that it would be preferable to nitrous oxide itself, as less stress would be thrown upon respiration during the inhalation owing to the presence of oxygen.

Between the time of reading this paper and correcting the proofs, I have given the mixture with much advantage to two patients of 71 years

of age; and I shall certainly continue to employ oxygen in such cases.

With regard to the after effects I cannot speak quite so favourably as I could wish. Speaking generally, we may say that the larger the quantity of any anæsthetic given, the longer will be the time taken for the effects to pass off. Whatever may be the disadvantages of ordinary nitrous oxide, we must all admit that it has one great point in its favour, viz., that the return to perfect consciousness after its inhalation is, with the rarest exceptions, remarkably quick and satisfactory. The speedy return to intellectual activity is connected with the short period of inhalation. As already indicated, we possess in oxygen a vehicle for nitrous oxide—we can introduce any desired quantity of the anæsthetic into the circulation of the patient. But the long period of inhalation thus rendered possible has its drawbacks. Although this prolonged inhalation leads to a longer available anæsthesia, it necessarily also entails a more tardy return of the normal faculties than in the case of nitrous oxide alone. Thus patients are not able to leave the chair quite as quickly as under ordinary circumstances. A feeling of drowsiness and disinclination to move may often be observed. If the patient attempt to walk immediately after the operation he will be liable to exhibit more unsteadiness of gait than

is usual after nitrous oxide free from oxygen. Nausea, retching and actual vomiting, although very rare, are certainly somewhat more liable to occur than after the usual administration of nitrous oxide. It is difficult to speak positively upon this point; and further inquiry is needed.

E.—Conclusions.

So far as my experience has gone, I am inclined to regard the use of oxygen with nitrous oxide as of distinct advantage in the large majority of cases in dental practice. But we cannot shut our eyes to the fact that the administration of the mixed gases involves more time, more attention to detail, and more skill than are essential for the employment of nitrous oxide in the ordinary manner; whilst the risks of unpleasant after-effects are a trifle greater. It hence follows that unless we can show that the gain is considerable, we are hardly justified in advocating any departure from the usual lines of practice. I have attempted to point out that *in many instances* this gain is considerable, and for my own part I shall certainly continue to use the mixture in preference to ordinary nitrous oxide for such cases. But when a very short operation has to be performed upon a patient who has taken nitrous oxide itself on a previous occasion with the best results, when

any additional preparation might alarm a nervous subject, or when time is a matter of great consideration, the use of nitrous oxide *per se* is possibly preferable to that of the mixture. I need hardly remind you that it is not always an easy matter to prophesy the duration of an operation. A tooth which is looked upon as easy of removal often gives trouble, and under these circumstances an additional fifteen or twenty seconds in the anæsthesia may make all the difference in the result of the case.

By the use of the apparatus brought before your notice, an attempt may be made in every case to secure the satisfactory form of anæsthesia which has been described. Should the case turn out to be an exceptional one, nitrous oxide alone can at once be substituted with the best results. In this way every case may be brought to a successful issue. The extra trouble incurred by having a bag full of oxygen in communication with the ordinary nitrous oxide apparatus is very small, whilst the benefits that will result in the majority of cases from the addition of a proper proportion of this gas are very great.

The mixture is to be chiefly recommended, as preferable to nitrous oxide itself—

(1) In children:

(2) In anæmic and debilitated patients:

(3) In any one who has previously exhibited

great susceptibility to nitrous oxide, and has remained a very short time under the influence of the gas :

(4) In patients who, under nitrous oxide itself, have experienced unpleasant sensations :

(5) In patients very advanced in years, and in those suffering from such serious visceral disease that ordinary nitrous oxide seems unadvisable.

In conclusion, I feel that I must tender you my best thanks for having so patiently listened to this communication. I can only hope that others will give this plan of producing anæsthesia an extensive trial, and thus throw fresh light upon the subject.

Discussion.

Mr. G. H. Bailey very warmly eulogised the enthusiasm, ability and energy which Dr. Hewitt's paper displayed. He had not had the experience of Dr. Hewitt with nitrous oxide and oxygen combined, but he thought from Dr. Hewitt's figures the average of "going off" was over two minutes, the average anæsthesia seemed to be thirty-four to forty seconds, but curiously enough the number of teeth got out did not appear to be so many as with ordinary nitrous oxide—2.7 did not seem to him to be a large number; he could not help thinking that with ordinary gas it would be more. The patient certainly had no loss of colour, no jactitation, no "phonation"—although he saw no objection in this—there was no rigidity; these were advantages. At the hospital they had an excellent nurse, and he had asked her, "What difference do you find between the days we have pure nitrous oxide and the days we have the mixture—have you less noise but more sickness?" And she said, "Certainly." This was in favour of the mixture. But he had observed in conversation with Dr. Hewitt, that the complication of the apparatus and the uncertainty of the amount to be given were objections. Now as to change of colour under the gas, he did not think that there was very much change of colour with nitrous oxide; his custom was to use the expiratory valve only, and to keep a gentle pressure with the hand upon the bag, and practically one obtained good anæsthesia lasting at least twenty seconds. Now he would just take the list of cases he had had that day:—

(1) Pure nitrous oxide and a little ether administered. The eye of the patient was taken out in two minutes. Now with Dr. Hewitt's apparatus the patient would be "going under" during this two minutes.

(2) A boy, aged 10; a lower molar removed, no change of colour, no jactitation, nitrous oxide being given alone.

(3) Nitrous oxide and a little ether: ten teeth removed in one minute and a half.

(4) A gentleman of large build, very muscular; tooth removed without noise in one minute and a half. Nitrous oxide.

(5) A boy, who had just come in from cricket, said that ether disagreed with him; had pure gas, tooth out in fifteen seconds.

(6) Five teeth removed from a very ruddy full-blooded man; no unpleasantness. Nitrous oxide only.

(7) A young fellow of the bull-dog sort, very bad teeth, had gas only; the tooth broke, but afterwards came out; no change of colour, no jactitation, barring a little kicking.

That was his experience of the day. If he had given the mixture in these cases he thought that they would have said he had had a good result. It struck him that anæsthesia with nitrous oxide only was not so short as Dr. Hewitt stated; it would, unquestionably, last for the removal of three teeth. With regard to children varying from 10 to 13, he believed he had in one morning ten of them; there was no phonation, no kicking, and the breathing was beautiful. Dr. Hewitt thought the recovery was not so good with the mixture as with nitrous oxide. If that were the case, surely, with the complication and other disadvantages, it was not so valuable. As to the length of time "going off," Dr. Hewitt very kindly gave him (Mr. Bailey) gas on two occasions, and the last time he said "Shall I give you a mixture with oxygen?" But he (Mr. Bailey) said, no, he would rather not, as he took gas so very well. However, he was a long time getting under the influence of the gas. He thought the length of time getting into a state of anæsthesia was a very serious objection, as it was very trying to the friends of the patient. When giving nitrous oxide it was his custom to count the alphabet, and he never got a struggle further than between G and H. If one could get a patient under the influence in nine seconds, that seemed to be a good result, and it was

the valuable thing in nitrous oxide, viz., the shortness of time in which one got anæsthesia. He could not help thinking that Dr. Hewitt troubled himself unnecessarily about the change of colour. When nitrous oxide first began to be given the leading physicians, Gull, Jenner, and others objected to it, owing to the change of colour which it produced, but what happened? After they had seen it given for a little time, they all said that there was no harm whatever in this symptom, and that, Mr. Bailey thought, was at present the general consensus of opinion. The jactitation might be, certainly, a bad thing, but that would vary enormously and very seldom prove troublesome. He had given gas to his own little child before she was 3 years old, and he had even given it to children only one year old. Again, he had given pure nitrous oxide to a lady of 96, and there had been no change of colour. Dr. Hewitt said that 76 of the cases were perfect, but if one took 153 cases of pure nitrous oxide he (Mr. Bailey) thought one would get as good a result. He had never given ether with the students at the Dental Hospital, because he thought that they should learn to give nitrous oxide pure, and he believed he got quite as good a percentage as Dr. Hewitt with the mixture. With regard to the apparatus, it seemed to him to be all but perfect, except for its somewhat ungainly bulk, but the question was if it was desirable to have so complicated an apparatus. In conclusion, he begged to thank Dr. Hewitt most heartily for the manner in which he had carried out his investigations.

Mr. Rowell said that it had been his privilege to assist Dr. Hewitt, and he had also given the mixture on his own account. He could only say that he thoroughly concurred in all Dr. Hewitt's conclusions. He commented upon the very high excellence of the paper from a scientific point of view, and the great difficulties Dr. Hewitt had had to encounter. Referring to the blood pressure under the mixture, Mr. Rowell said a physiologist put a dog under the mixture, and found no more increase of blood pressure than if it had been given air alone. Without going into details, he would just mention one case which was quite

enough to show that it was not deleterious. A German physiologist put a dog under it for forty-eight hours, and it woke up all right, except that it was rather "off its feed." There was one point that he wished to emphasise, and that was the beautiful sleep-like condition which was most marked with the mixture.

Mr. Lloyd did not agree with the previous speaker as to the advantages of the "sleep-like condition;" he thought it rather a disadvantage, as it rendered difficult the detection of when the patient was fully under the influence of anæsthesia.

Mr. R. H. Woodhouse wished to say only just one word in justice to Dr. Hewitt, and that was to put on record the fact that his (Dr. Hewitt's) operations were mostly done by students, and though they did their work with great care and did it very well, still they had not had the experience of dentists in practice. Again, if the students broke a tooth it was *their* fault, whereas if a qualified man did so it was *the tooth's* fault, so that this would tend to make them longer in their operation. He had had the opportunity of observing Dr. Hewitt's cases, and the conditions had been splendid; it was only the after-effects that he had any doubts about, he was not sure that there was not more headache with the mixture.

Dr. Dudley Buxton said that he could not but feel that with the hand of the clock pointing to five minutes to eleven it would be impossible to attempt to enter upon anything like detailed criticism upon Dr. Hewitt's paper; he would therefore content himself with offering him his congratulations upon the valuable contribution they had heard read.

Mr. William Hern, as one of Dr. Hewitt's colleagues, desired to bear testimony to the very great care with which Dr. Hewitt had conducted his investigations, and to express his sense of the high scientific value of them; he also wished to add that he had been very much struck with the splendid effects upon children which the mixture produced, from the point of view of the operator.

Mr. W. T. Trollope did not propose to occupy the time of the Society for more than a few minutes, but as he had

been using the mixture of nitrous oxide and oxygen for the last eighteen months, he should like to say that his experience had been entirely in accordance with Dr. Hewitt's. He had been using the apparatus that was first shown by Dr. Hewitt at Brighton, from a telescopic gasometer. He certainly found the results most satisfactory; he got longer anæsthesia and no stertor, &c.

Dr. Hewitt, in reply, said that it only remained for him to thank them very cordially for the discussion. With regard to Mr. Bailey's remarks, Mr. Woodhouse had answered in one way what Mr. Bailey was wishing to know, but Dr. Hewitt thought that 2.7 was a very good average for students. Perhaps in private practice it was possible to get more teeth out, but it must be borne in mind that these statistics were compiled mainly from hospital work. Mr. Bailey said that there was very little change of colour; Dr. Hewitt would not contradict this. It was possible that one did not always recognise the change of colour; he usually got others to notice the lividity under nitrous oxide, and want of change of colour in oxygen cases. He should say no more on the subject, but he maintained that there was no change—or very much less with the mixture than with the nitrous oxide alone. Dr. Hewitt did not claim that the combination was best for all cases, but he looked upon it as a good alternative to nitrous oxide, and better than it for many cases. Mr. Rowell had said that the dog was under the influence forty-eight hours; as a matter of fact he was kept under for seventy-two hours, and at the end of that time the only difference in him was that he was not quite so lively as before. Mr. Lloyd objected to the sleep-like condition, but the signs he (Dr. Hewitt) had referred to were reliable and tangible signs. The last speaker had very kindly referred to his administrations of nitrous oxide and oxygen. There were several dentists in the provincial towns who were using the mixture, and he (Dr. Hewitt) had received many letters from them. He had said very little about the actual safety of the mixture, but if it could be said that anything was safer than nitrous oxide, he thought it might be said of nitrous oxide and oxygen.

Votes of Thanks.

Votes of thanks and announcements for next meeting concluded the business.

INDEX.

A.

ACKERY, Mr. John, on persistence of temporary teeth, 39

Address, inaugural, 93; valedictory, 79

Albert, Mr. L. H., on a case of anchylosis of jaw, 36; case of asymmetry of the jaws, 57

Annual general meeting, 55

Anterior protrusion of the jaws, discussion on, 117

B.

BADCOCK, Mr. J. H., on separation of fragments of bone after section of jaw, 175

Bailey, Mr. G. H., on oxygen and nitrous oxide, 240

Baldwin, Mr. H., on anterior protrusion, 130

Barrett, Mr. Ashley, presentation of models of irregular dentition, 12; presentation of models of a case of myeloid tumour of lower jaw, 34; on electric light for trans-illumination, 141

Bennett, Mr. Storer, on anterior protrusion, 127; on alveolar abscess in Malayan bear, 166; on fixation of fragments after section of jaw, 176

Bennett., Mr. J. F., on the growth of the jaws, 159

Betts, Mr., presentation of excising forceps, 12; on anterior protrusion, 130

Boyd, Mr. Stanley, on cystic tumours of the aws, 169; on prevention of displacement of fragments after fracture of jaw, 169-177; on a case of fixation of jaws, 178

Brunton, Mr. G., on device for heating dental materials, 116; on anterior protrusion, 126

Buxton, Dr. Dudley, on simple apparatus for giving nitrous oxide with "whiff of ether," 38

C.

CANTON, Mr. F., on a case of abnormally large left central incisor, 193

Cartwright, Mr. Samuel, death of, 1

Casual communications, 3, 32, 57, 90, 112, 134, 166, 184

Coffin, Mr. Walter, on anterior protrusion, 124

Colyer, Mr. F. J., a case of supernumerary tooth, 36; on treatment of fracture of the jaws, 64

Coxon, Mr. S. A., a case of cystic sarcoma of jaw, 166

Cunningham, Mr. G., on fixation of fragments after section of jaw, 176

Curator's Reports, 3, 32, 5 (Annual) 90, 112, 166, 184

E.

ELECTION of members, 2, 31, 55, 89, 112, 133, 165

Election of officers of the Society, 78
Eve, Mr. F., on cystic tumours of the jaws, 169

G.

Gould, Mr. Pearce, on a case of fracture of the neck of the lower jaw, 184; on the treatment of dental cysts by excision, 187
Gum, continuous, on a new method of moulding and working, 41

H.

Heath, Mr. Christopher, on asymmetry of the jaws, 62; on epithelioma of the jaws, 67; elected honorary member, 89
Hepburn, Mr. David, on anterior protrusion, 117; on an instrument for guaging depth of canal in antral cases, 192
Hern, Mr. William, presentation of mummy skull, 3; on a case of pedunculated tumour removed from the mouth, 8; on case of removal of lower jaw, 35; on anterior protrusion, 129; on excision of dental cysts, *versus* incision and drainage, 190; on nitrous oxide and oxygen, 243
Hewitt, Dr. F., on the use of nitrous oxide and oxygen, 194
Hooton, Mr. J., on a new method of moulding and working continuous gum, 41
Hutchinson, Mr. S. J., valedictory address, 79; on anterior protrusion, 130; necrosis and fracture of the lower jaw, 134; on a model of unilateral anterior protrusion in an adult, 192

J.

Jaws, epithelioma of the, 67; studies on the growth of, 143

L.

Librarian's Report, 3, 56; (Annual) 112, 133, 165, 183

M.

MacCormac, Sir William, on cystic tumours of the jaws, 168
Maggs, Mr. W. A., presentation of ancient bone remains, 7; on growth of the jaws, 160
Matheson, Mr. L., on a mandrel for emery discs, 40
Meriam, Dr. H. O., elected corresponding member, 2
Mummery, Mr. J. H., on preparing tooth sections, 27; elected President, 78; inaugural address 93

N.

Newland-Pedley, Mr. F., on a sequestrum from alveolus, 112; on fixation of jaw after section, 174

P.

Paterson, Mr. W. B., on growth of the jaws, 159; on fracture of the jaw, 186; on treatment of cysts by excision, 189
Presidential addresses—inaugural, 93; valedictory, 79

R.

Read, Mr. Lawrence, on case of removal of lower jaw, 35
Robbins, Mr. C. C., on a simple gutta percha heater, 105; on fixation of fragments of jaw, 176
Röder, Dr., on an universal elevator, 193
Roughton, Mr. E. W., notes on case of sarcoma of palate, 113; notes on case of removal of ivory exostosis of lower jaw, 178

S.

Smith, Mr. A. H., on a new method of preparing sections of teeth and bone, 13

Stocken, Mr. James, presentation of models of erosion, 12; on fixation of fragments of jaw after removal of a portion, 175
Storey, Mr. J. C., on anterior protrusion, 128

T.

TEETH, method of preparing sections of, 13
Tomes, Mr. C. S., F.R.S., on a case of purulent discharge from both parotid glands, 32; on sections of a tooth showing artificial caries due to (?) fungus, 91; studies on the growth of the jaws, 143, 160
Treasurer's Annual Report, 57; balance sheet, 58-9
Turner, Mr. J. Smith, on the teeth of the Guanches, 191

U.

UNDERWOOD, Mr. A. S., on preparing tooth sections, 28
Underwood, Mr. Thomas, elected honorary member, 32

W.

WALLIS, Mr. C. J. Boyd, on a switch board for controlling electric current, 38
West, Mr., presentation of some old dental instruments, 134
Williams, Mr. H. Lloyd, on fixation of fragments after section of jaw, 176
Woodburn, Dr., excising forceps, 12
Woodhouse, Mr., on anterior protrusion, 122
Woodhouse, Mr. R. H., models of irregularity, 33; parallel action bracket, 33; persistence of temporary teeth, 12; on anterior protrusion, 128; on nitrous oxide and oxygen, 243
Woolf, Mr. W. Y., on a tooth forced into and retained in the antrum, 137

WELLCOME LIBRARY INSTITUTE

ILLUSTRATIONS.

PORTRAITS—
Spence Bate, F.R.S., L.D.S.I., 1
Charters White, M.R.C.S., L.D.S., 133

FIGURES—
I. II. and III., pedunculated tumour, Mr. Hern's case, 9, 10, 11
On working continuous gum, 47-49, 50, 51
On anterior protrusion of the jaws, 121, 122
Diagrams illustrating the growth of the jaws, 150-3

PLATES—
I. and II. Sections of teeth, Mr. Hopewell Smith's paper on preparing tooth sections, 22
III. Mr. C. S. Tomes, on purulent discharge from parotid glands, 33; section of an old tooth, showing tunnelling, &c., the result of fungus action, 90
Mr. Stanley Boyd's case of removal of tumour of jaw with fixation of fragments of jaw, 172

JOHN BALE & SONS, Steam Printers, 87-89, Gt. Titchfield Street, W.